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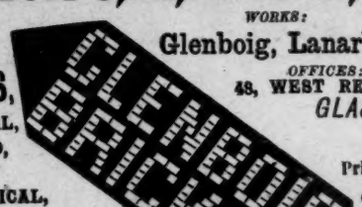

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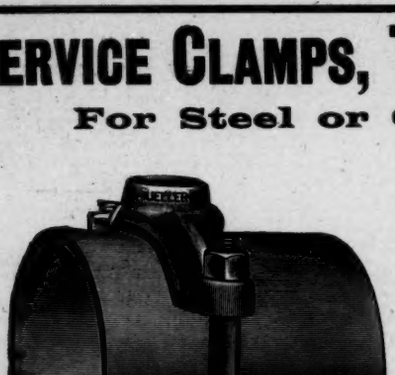

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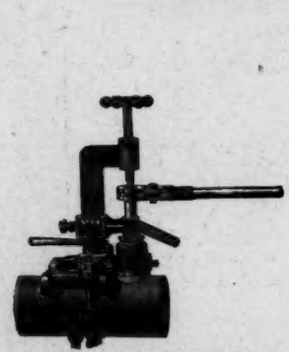

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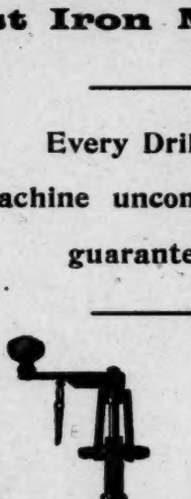

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EDITORIAL NOTES.

Fuel Economy and National Necessity.

As we anticipated would be the case, Professor William A. Bone, F.R.S., has taken up with energy the work that, with especial appositeness, lies at his hand—of pursuing a campaign against the national foe of fuel waste, and urging the adoption of constructive measures that would result through fuel saving in the promotion of the country's economic opportunities and welfare. The campaign was started by him in his Presidential Address to the Chemical Section of the British Association; and through that address the real importance of the subject was transmitted to others. The address was followed by the appointment of a strong and influential Committee, to make thorough investigation and to report, through the Association, to the public and, if need be, to the Government. The British Association could not have taken under its *agis* a matter of greater practical value to the nation; and, so encouraged, no time has been lost by the prime mover in doing what has been possible by a single individual in stimulating public interest, and particularly that of the industrial users of fuel. Addresses on the subject have been given by him before various Associations—among them a short one at the dinner of the Coke-Oven Managers' Association. Now he is hammering away at the question in, or at any rate he is weaving it well into the composition of, three Thursday afternoon lectures, on the "Utilization of Energy from Coal," that he is delivering at the Royal Institution. He has a prominent platform there; but it could be wished that, through the lectures, the general Press of the country could be brought to see that there is a topic here for them that is equally as momentous as, and one which has a more concrete foundation than, that of *post*-war trade, to which columns of most of the daily papers are being regularly devoted, and which is in some quarters being treated in a very abstract manner. In the first lecture alone (as will be seen elsewhere in this issue), a good case is—particularly in the first and the last sections—made out for the action that is being taken, and for more determinate action still on the part of the Government. If the deserved reward crowns this work, then Professor Bone will have brought to the country more material benefit than have done—necessary and valuable as they have been to progress in knowledge and in the application of scientific discovery and rule to practical ends—those refined researches within the laboratory that have placed him in the fore rank of contemporary scientists.

In the first lecture, no room for doubt was left in the minds of the audience as to the lecturer's feelings upon the subject of the waste of fuel. He hit at it straight from the shoulder, and raised it from the commonplace of a mere monetary question to the individual user of coal to a position of primary importance in national economics. Any form of waste is an evil in itself; but waste multiplies evils—in this case, in a manner which causes deterioration to, and destruction of, both life and property, and lays to waste much of Nature's provision for our health, wealth, and delight. There is large work to be done in making the people individually and collectively appreciate that coal, which is the very root of our national prosperity, is a storehouse of substances each of value, and in the aggregate of immeasurable worth, and that every process utilizing coal which unnecessarily destroys any of those substances in realizing (say) only one of its properties is a contributor to the destruction of usefulness and therefore of wealth. Economy is being freely preached to the people by politicians and economists; and the country is being flooded with words and precept which are largely out of touch with practical attainment. Here, however, a practical matter is presented through which huge economy may be achieved, and the fortunes of the country be progressively augmented. Yet few appreciate and understand it, though waste protrudes its hideous features in all large centres of population and of industrial activity. Of course, a revolution from waste to economy, where the conversion of processes means research and time, cannot be accomplished at a word of command. Legislation itself could not bring about any immediate conversion. It cannot therefore be hoped that much progress will during the war be made in this matter, except in the way of preparation. There is, however, considerable preparation to be made, and that is what is of particular concern at the present time. Even so, with present processes, there is much that could be at once done by improvement in supplementing necessaries for which there is imperative and enlarging request in connection with the prosecution of the war. In this connection, the Ministry of Munitions comes in for censure from Professor Bone, for "culpable negligence" in having so far disregarded warnings and representations concerning the importance of organizing a more competent chemical supervision over the bye-product coking plants from the point of view of enhancing the yields of both benzene and toluene.

We have also to look forward to what Professor Bone, early in the lecture, calls the "trying years of economic "recuperation and readjustment" that will follow hard on the termination of the war; and the country should start upon those years with the deliberate intention, under the encouragement of the Government—insistence could come later if need be—of converting present fuel waste into national profit. When Professor Bone speaks of savings through the proper utilization of coal in terms of millions of pounds, he is not using the language of the hyperbolist. He is fully cognizant of the approximate value there is in a ton of different classes of coal; and he also knows approximately the quantity of coal per annum that is used destructively to all its properties but the one of heat raising or the realizing of a single product. Millions of pounds saving per annum! And capable of being saved in our very midst! These are statements that should arrest the attention of our politicians and economists, should excite their interest, and should stir them from past lethargy due to ignorance upon the matter to very positive action.

There are those who think a potent and sufficient impelling force in securing fuel economy will be the certain prospective higher prices of fuel; but we are with the lecturer in the opinion that such process alone would be very slow. In fact, leaving the production of economy to the operation of this force would only aggravate the uneconomy, through the ease of the course of transferring the additional fuel costs to the consumer of the products resulting from the use of the fuel. There are excellent examples, and Professor Bone knows of them, of proved economy by the application of new processes and the setting up of proper supervision—chemical and otherwise. This proved economy, however, has not had universal effect; the old wasteful processes have been kept alive by indifference, and have continued to pursue their value-destroying way to attain nothing better than the old goal. A larger and higher incentive is now necessary. Professor Bone does not ask at first for drastic legislative measures and interference in securing fuel economy. It is necessary to go to work constructively. "What is needed is a patriotic exchange and "pooling of experience—a willingness to co-operate wholeheartedly and effectively, under skilled guidance and advice, for a national benefit; and this cannot be achieved "except on the basis of some national organization." Beyond this, a systematic investigation of the chemical nature of coal and a chemical survey of the principal British coalfields are needed. For this work, "we already have in the "country all the means, as regards men and equipment; "and it only remains for the authorities who administer "money voted by Parliament for scientific and industrial "research to provide adequate grants for its effective prose-

"cution." There is nothing revolutionary here—nothing impossible of attainment. It is only common sense. The work of developing fuel economy is one that must be undertaken systematically and by gradation. The initial steps are the only ones Professor Bone has at present under consideration; and they are immediately sufficient. From them, if accepted and prosecuted, will issue development towards the ultimate goal.

Sliding-Scale and Dividend Shrinkage in Abnormal Times.

NOTICED lately have been further instances of additional increases in the price of gas having been necessitated by the inexorable circumstances inflicted by the war; and in the case of sliding-scale companies, these extra increments of price to produce larger revenue mean to the proprietors the sacrifice of still more dividend. And it is a question whether, in the case of certain not well-placed companies, the relationship between price and dividend will not be still further widened. There is under present conditions good cause for very deep sympathy with the proprietors in some sliding-scale gas companies; for the very system that maintains a happy position between them and the consumers in normal times is making their investment in gas less and less valuable as a contributor to their financial needs just at the period when these needs are the greatest. They are in the present darkened and inordinately conditioned days—when prices to consumers are forced up by the accumulation of every species of abnormality that ever formerly, but individually, came on the undertakings, and net dividends are forced down by the sliding-scale—in infinitely worse case than shareholders in maximum-price gas companies and concerns in other industries that can better "trim their sails "to the prevailing wind," by advancing prices to meet the war-imposed burdens, without maybe losing anything in the way of dividend.

We dealt specially with this matter in the "JOURNAL" for Sept. 28 last; and now as we see the costs of materials still rising, difficulties of transport still active and worrying, labour expenses and labour shortage with tendencies in the directions contrary to those that would be helpful, the creeping upward of the expenses brought about by humane considerations for fallen, incapacitated, and absent employees, the still reduced business through military requirements and local protection, and through the business inertia brought about by the forceful claims of economy, the difficulties of capital raising, and the additional obligations imposed upon gas concerns by patriotism and loyalty to country, we also see the strengthening importance of this matter of the effect of the sliding-scale in such a time when everything has deviated from the path of regularity. With the coming-in of income-tax demands and the knowledge of the heavier income-tax deductions that are to be made from the half-year's dividends shortly to be declared—weightier income-tax on much lighter dividends under the sliding-scale—the position of many gas proprietors will not be a happy one. Of course, such maleficent conditions were never contemplated at the birth of the sliding-scale as applied to gas companies. But we have them now, and are feeling their full effects. It is therefore a question whether something should not be done to bring about an extension of the sliding-scale by making provision to, at the discretion (say) of the Board of Trade, relieve proprietors of companies working under it of at any rate the full results of conditions that cannot be classified as ordinary, and that produce, as now, something much more burdensome than is the case with the comparatively simple irregularities of peace times. It may be remarked: "Why worry about making such pro-"vision, seeing that we are not likely to have another world-"disturbing war like this for many a generation." We hope not. But who can tell? And having experienced a defect, why not move to get it remedied? With the fusion of labour organizations, including the miners and transport workers, for militant purposes in respect of their affairs, there may come such internal dissension and disturbance of conditions that, with shortage of material and a ramp in prices, an appeal to the Board of Trade for the suspension of the sliding-scale, in relation to additional costs directly produced by such occurrences, might be very valuable in assisting to protect gas proprietors and maintain the good opinion of investors and the market value of gas stocks, as well as the capital-raising position of companies. We quite recognize that, in any circumstances, some sacrifice would have to be made before there could be any movement to disturb the operation of the sliding-scale; but the sacrifice ought not to extend to the depreciation of income, stock values, and position now being experienced, or that might be experienced in conceivable circumstances other than an international war.

Such revision or extension of the sliding-scale, however, is a matter for the future, and not the present. As to the present, it has been on a previous occasion suggested in the "JOURNAL" that there ought to be suspension of the sliding-scale in respect of such increase in the price of gas as is the direct outcome of the war, and which increase, through the effect upon dividends, has brought about the very grave depreciation of stock values and capital positions. Suggestion has also been recently made that one of the organizations of the industry should at once take up the matter of trying to secure a suspension of the operation of the sliding-scale in respect of the super-costs chargeable to the war. Such suspension of the law could only be brought about by the passing of a short Act of Parliament; and the Government are not at all likely to consider at the present time the passing of short Acts for the special convenience of a single industry, especially seeing that they will not look at measures of even general importance, unless they immediately concern or grow out of the war. It may be said that this matter of shrunken net dividends does grow out of the war. We know it does. The difficulty would be to get the Government to appreciate what we in the gas industry appreciate, and some of us acutely feel. The sliding-scale was accepted for better or for worse; and no one thought of a provision to cover exceptional and exigent circumstances. We have to suffer from the omission now, and, so far as we can see, must grin and bear it, though it presses hardly on the investor of slender income, and on the widow and orphan with perhaps no other financial resource. But, under the circumstances of to-day, let us take thought for the morrow. We may not ourselves benefit from an amendment of the sliding-scale such as is suggested (we hope there will be no occasion to), but to think only of ourselves, and not of our children and the future conditions of the industry, and to make no effort (because it may not advantage us directly) to remedy a legislative defect revealed by extraordinary conditions, would be a very selfish and an impolitic attitude.

Coal at Six Pounds per Ton for Gas Making.

THE country is at length being aroused to the nature of the heavy burden that it is being called upon to bear, through the prices of its necessaries in food and otherwise, by the enormous profits that are being made by shipowners on their tonnage. The newspapers are alive with articles and correspondence upon the subject. In Parliament, too, the question is being frequently referred to; and the Government are not coming with flying colours out of the ordeal of a critical examination of their do-nothing policy. As a matter of fact, they have not done anything to stop the upward flight of rates, nor have they attempted any control of shipping. On the contrary, they stand convicted of having adopted methods in the requisitioning of ships for transport work which have been a factor in forcing-up prices. There has been an extravagant waste and mismanagement of the requisitioned tonnage; and this is practically admitted by Mr. Runciman when he acknowledges that an endeavour is now—only now!—being made to co-ordinate more closely the demands for tonnage for naval and military purposes and for munitions and food for this country and its Allies, with a view to the securing of economy in the requisitioned steamers and to increasing the available tonnage.

Confessedly, there is pressure on tonnage; but some experts assert that, if properly handled, the tonnage at command before the war, making due allowance for wastage through the war, would be sufficient for ourselves and our Allies. The "shortage" due to the asserted mismanagement is translated into inequality of supply to demand. And the operation of the law of supply and demand is put forward as the excuse for what is happening. But the published rates of freight and other data show that, whatever the causes of the demand exceeding the supply, there is no law that can appease or restrict the appetites of the shipowners. The fact that fabulous profits are now being made by them out of the war conditions cannot be gainsaid, although the published figures by reputed authorities inform us that, if 50 per cent. were added to pre-war rates, the extra costs due to the war would be amply satisfied. The owners say

that whatever their excess profits, the Government, under the new Finance Act, will benefit to the extent of 50 per cent. But the fact stands out clearly that, since the introduction of the Budget, the owners have put up the rates to such an extent that, after deducting 50 per cent. of the excess profits, they will still be in as good a position as they were in before the introduction of the Budget. Another point of interest that has transpired is that hundreds of ships have been sold to neutral countries since the war began. This ought to have been prevented.

Owing to the freight situation, a large number of gas undertakings at home which have to rely on seaborne coal, and have no ships of their own running, are suffering enormously; and in many instances owing to the congestion on the railways, and especially is this the case with towns in munition-producing areas, where the sidings are rarely free, it is a question of Hobson's choice—either the rates of freight have to be paid, or the supplies of coal be deficient of requirement. But although such home gas undertakings are suffering acutely, the injury to them—though indefensible—is modest in comparison with what British gas undertakings working abroad, and the gas undertakings in allied countries using British coal, are suffering. We recently referred to the Milan Gas-Works (in which the Continental Union Gas Company are heavily concerned) as a case in point. Only last week, it was announced that at one time freights to Genoa had risen to 86s. per ton (80s. was subsequently quoted); while before the Boer war a rate as low as 3s. 10½d. was accepted. Add to the 86s., possibly, 22s. per ton for Durham coal, and several shillings for labour, distribution, and handling expenses from Genoa to the stores of a gas-works at a distance, something not far short of £6 per ton would be reached before the coal is put to the use of gas-making. With a gas-production of 12,000 cubic feet per ton, this works out to 10s. per 1000 cubic feet, less residuals. Yet this is in all probability not the worst case that could be taken for illustration.

French Masks for German Pipes.

Since the war started, attention has been prominently and frequently directed to the ramifications of German trade in all countries. In this country, it has been found in every city, town, street, and at our very doors; and yet many of us failed to recognize it. The reason for this is that, while some of the trade was conducted openly, much of it has been carried on through agencies or under guises denoting a nationality other than German. This commercial stratagem and deceit find their only commendation in the cleverness that has brought about success in befooling the people in practically every country. This befooling is, however, now having applied to it the old saw, "Once bitten "twice shy." People do not like to be accounted the subjects of the artifices of such wily ones as German traders; and having been once duped, and convicted of having failed to penetrate the disguises, they will use every effort to avoid being placed a second time in similar position. One of the masked companies is La Société Metallurgique d'Aubrives et Villerupt. With this Company British gas and water engineers have long been doing willing business for various reasons—such as price, the attractions of the mode of vertical casting, and in furtherance of the *Entente Cordiale*. The German has smiled, and has rubbed his fat hands gleefully over the success of his duplicity. Since 1909, at the head of this concern with the name in unblemished French has stood Herr Thyssen, and at his back has been the Gelsenkirchen. While, therefore, gas and water engineers have been under the impression that they have been doing business with a French firm, their payments for these pipes have actually being profiting Germany. This is only part and parcel of a well-conceived and equally well-executed scheme on the part of German manufacturers and ironmasters for securing control of the French iron mines and foundries, and to continue trading under the old style, which in the new circumstances is deceptive. Now the question for British gas and water engineers is, "Are we going to continue to help the Ger-"man money-making machine henceforth by purchasing "pipes which *de facto* are German, though enveloped in "a French name?" This in effect is the question that "Anti-Germanicus" puts in a letter in our "Correspon-"dence" columns to-day; and we are obliged to him for doing it. To relieve him of any notion on the part of others that there is some personal motive at the back of his communication, we may say at once that he is an engineer—a "M.Inst C.E."—interested in both gas and water supply, and without any ties so far as pipe founders and pipe selling in this country are concerned. But he does feel very keenly the bamboozling of British engineers by Germans in the manner related in his letter; and, in his opinion, some effort should be made so as to prevent resumption of this form of trading and unfair competition—unfair, while the goods are admitted to this country free, but a barrier of import duties in other countries limits the export opportunities of British pipe founders. We shall be pleased to help forward any movement in the preventative direction which commends itself, and is well-supported. The question is, What form should this effort take? There might be an open declaration that no more business will be done in foreign produced pipes unless there is perfect satisfaction that the firms with whom the business is being done are entirely free from German control and (in whole or major part) financial influences. The subject of the nature of the effort that should be made is one that would bear discussion

Construing an Agreement.

There are unusual features about an arbitration, the proceedings in which extended over last week, which had for its object to determine the price to be paid by the local Urban District Council, under an agreement confirmed by the Council's Act of 1914, for the gas undertaking of the Shropshire Union Railways and Canal Company. From the report of the opening speech and evidence for the Company, which is given to-day, it will be seen that originally the Company supplied only their own premises with gas; but later on they were asked to give a public supply, and did so. The Company's witnesses valued the undertaking as a whole; but when, on the fourth day of the hearing, the Council's case was opened, the point was formally taken that what the Company had agreed to sell, and the Council had agreed to purchase, was the undertaking for supplying gas which was not needed by the Company for their own purposes; and that they could not sell the right to supply gas which they needed themselves. In other words, what they were selling was the public portion of the concern—"a separate undertaking supplied from the old gas-works." This matter having been discussed, Counsel on both sides asked the Arbitrator to give his award in an alternative form, so that it might be taken to the Courts as a special case. On Monday, however, a settlement was arrived at between the parties, on the "separate undertaking" basis. An account of the later proceedings in the arbitration is held over until next week.

Gas in the Studio.

This is an old subject; but there is sufficient reason for it being raised anew in view of the changing conditions under which studio photographic work is now carried on. The application of gas to the purpose of portrait taking has never been tackled—at any rate, in this country—in a proper spirit, and with the requisite technical knowledge to make a success of it. The work that was done years ago was with low-pressure burners. Then installations were of a somewhat crude order; and there were perspiring moments as one sat between two rows of upright incandescent burners. But since then, spasmodically, there has been some experimental work with modern burners; and excellent portraits have been produced by their means. Our columns, too, have borne testimony to the production in gas-lighted interiors of work that could not be excelled for clear definition and detail, admittedly with longer exposures than would be tolerated for portrait work. This being so, it seems a pity that some more deliberate effort is not made to bring gas lighting definitely to the aid of the photographer in his work in the studio; for we believe that incandescent gas lighting does really possess all the qualities needed to produce good result, if there is proper application, and especially if the announcement made by the American Illuminating Engineering Society is correct, that progress has been made in the production of a mantle for incandescent gas-burners yielding a light of high actinic merit. This announcement has inspired the writing of an article which appears in other columns to-day, and which will be found very useful to those who would like to further investigate the matter, to see whether some better means cannot be devised for making a practical application of gas lighting to photography.

The Photographic Field and the Requirements.

The article shows that the field is large for utilizing gas for photographic purposes, if a proper system can be devised; it shows, too, that means of artificial lighting for portrait taking are an absolute necessity to-day to the professional photographer. It gives to him greater choice of location for his studio; it increases his working capacity; and the time extension for business enlarges his patronage. Electricity has hitherto held the field among high-class men on account of its ready applicability, rather than owing to any claim it can make to perfection in its qualities for the work. It is not by any means perfect—the fluctuations of arc lamps are bad; and the nitrogen-filled lamps cause trouble by their vacillating actinic energy with variation of load. With high-pressure gas-burners, and with low-pressure burners on a governed service, there are no flickerings or fluctuations of light; but, especially with the former, one can obtain a well-diffused and perfectly steady light, with (experimental work has proved) all the properties required. What is more, using fairly low-unit high-pressure burners, there would be, compared with low-pressure burners, a reduction in the quantity of gas consumed in relation to the power required in the studio. The article in other columns does not mention high-pressure gas lighting. And there might be difficulty in giving high-pressure supplies to the class—and it is a large class—of photographer specially referred to in the article. They could hardly afford individual installations, any more than they can afford to have electric lamps installed for their work. Those off the line of an electric cable will also in all probability be off the line of a high-pressure gas-main, unless their studios are in main streets, and in districts of enterprising gas authorities. The article sets out the requirements of the photographer; and we shall hope to hear it has had a stimulating effect. From anyone who has had practical experience in fitting-up for portrait taking the studio of a professional photographer, we shall be pleased to receive a description of the installation, and some account of the experiences with it.

A Tribute to the Gas-Furnace Makers.

The valuable work done by the gas-furnace makers, in designing and constructing in the shortest possible time, gas-consuming apparatus eminently suitable to meet the varied requirements of munition factories and workshops—of which full acknowledgment has already been made in the pages of the "JOURNAL"—was testified to by Mr. R. J. Rogers, in the course of a lecture, delivered last week, which is noticed in our news columns. Mr. Rogers, as the Assistant Fittings Superintendent to the Birmingham Corporation Gas Department, is in the very midst of munition making; and he has therefore had ample opportunity of seeing to what a great extent the efforts of the gas-furnace manufacturers have contributed to the output of munitions of war. Lectures such as the one referred to, illustrated by suitable lantern slides, and prepared on popular rather than technical lines, are an excellent means of informing the public of the very useful work that is being performed during war time, not only by the apparatus manufacturers, but by the gas industry generally. It is greatly to be feared that there are many towns in which the nature of this work has hitherto been but imperfectly understood.

The Error of "Electrical Industries."

No opportunity is lost in some electrical quarters of indulging in ill-conditioned snarling at the gas industry, and not only snarling but in circulating false information. The writer of "Gossip" in "Electrical Industries" has been jumping at a conclusion, has erred in doing so, and has given to his readers the erroneous result as positive and reliable information. The matter refers to the appeal made a week or so ago to gas consumers of the country in connection with the extraction from gas of toluol and benzol, without which, and other substances produced by the carbonization of coal in gas-works, this country would by this time have been well out of the war, and in a most ignominious fashion. Our contemporary observes: "The appearance in several newspapers of a uniformly worded patriotic appeal to gas consumers represents one of the cleverest advertising schemes yet undertaken by the British Commercial Gas Association." Again: "No objection can fairly be taken to this publicity effort, except that the innocent public ought to be protected from inferring that the appeal is made to them by the Ministry of Munitions." Still further: "The British Commercial Gas Association is to be congratulated upon its ingenuity in giving a patriotic touch to an appeal which will lead to increased business in gas-fires and gas-cookers." After this guesswork and error, it may likely interest the writer of "Gossip" to learn that the British Commercial Gas Association did not publish the appeal, which had the twofold object of attempting to satisfy consumers that, unless they are using gas for illumination purposes with open flames, they are not suffering any material injury by what is being done, and of pointing out to them that the more gas they use, the greater will be the source of the essentials for high explosives. The expense and the time devoted by gas undertakings to this matter of extracting vital necessaries from gas without compensating return, and the difficulties that have arisen through the inestimable service rendered to the country, have been quite sufficient without being supplemented by the snarlings and the dissemination of untruths by persons whose writing upon the subject show an utter want of appreciation of their responsibility. If the writer in "Electrical Industries" is animated by honourable feelings, he will take the earliest possible opportunity of withdrawing his assertion without any qualification whatever, and there let the matter rest, before he is tempted to say something that may bring him into contact with high authority acting under the Defence of the Realm Act. Much is being done under that spacious and far-reaching Act of which some people have not the slightest knowledge.

A New Coal Contract Clause.

It appears clear that the coalowners have not relinquished the idea of trying to obtain advantage from section 2 of clause 1 of the Price of Coal Limitation Act, which gives the Board of Trade power to raise the standard of 4s. if they are satisfied it would be just to do so in the circumstances. Meantime the coalowners and miners are engaged in the (to them) pleasant occupation of sharing in the excellent proceeds from the selling operations at home and abroad. But it seems that the coalowners are desirous that, if they can get the standard of 4s. raised to 5s., the sellers shall solely enjoy the benefit of the addition. This is what the "Iron and Coal Trades Review" has to say on the subject: "The coal industry continues to be actively employed generally, the demand exceeding the supply, and the top prices allowed by the Limitation Act ruling in the inland trade; while in the export branch they continue to have an upward tendency. It is also reported that collieries in making new contracts are inserting a clause stipulating that in case the 4s. margin under the Limitation Act should be increased to 5s., which may be the case, it is thought, if miners secure another advance in wages, the sellers should have the benefit of the extra 1s. per ton." Readers will note the words: "Which may be the case."

Enemy Trading and Registration of Firms.

There was read a second time in the House of Commons on Friday what is known as the Trading with the Enemy (Amendment) (No. 2) Bill, introduced by the Government. Under the terms of this measure, the Board of Trade are given discretionary power to prohibit the carrying on of any business during the war, or to wind-up any business now conducted in the United Kingdom by persons of enemy nationality or association, or for the benefit of subjects of enemy States. The members were officially assured that the measure will be administered with the single purpose of getting rid of the German element in our trade; and if this be so, it will be a welcome addition to the Statute Book. A report is to be made to the House from time to time as to the progress of operations; and the names of the firms dealt with will be supplied. Another Bill, introduced by Lord Southwark, had for its object to provide for the registration of firms and persons carrying on business under trade names. The full name or names of the person or persons carrying on the business were to be submitted in writing; and there was to be a re-registration, with the prescribed particulars, on any change of trade name. The Board of Trade would, if the Bill became law, have power to fix a fee (not exceeding 5s. for registration); and the Registrar of Joint-Stock Companies would act as the Registrar in connection with the measure. The proposal to read the Bill a second time was, however, negatived.

In the Company World.

From the list which appears on another page of some of the companies which have been either dissolved or struck off the register, it will be seen that the Board of Trade report for the year 1914 on matters within the Companies Acts, 1908 and 1913, has made its appearance. Taking the figures of additions to, and removals from, the register in England and Wales, there is shown a net increase for the twelve months in the number of companies amounting to 2361. This is a substantial augmentation, though far behind the net gain of 3898 recorded for 1913. Companies come, and companies go; for in 1914, while there were no less than 5701 new companies registered, 2017 went into liquidation, and 1323 were removed from the register on the ground that they were no longer carrying on business. The early effects of the war were being felt, inasmuch as the figure of 5701 for new registrations compares with 6871 in 1913, and 6796 in 1912. Excluding those which were in course of liquidation or removal from the register, the number of companies on the register in England and Wales at Dec. 31, 1914, was about 59,000; the total for the United Kingdom being some 66,000. As usual, there were a certain number of companies licensed to be registered with limited liability, but without the addition of the word "Limited" to the name, as associations formed not for purposes of profit; and there is included in the list the Institution of Petroleum Technologists. Change of name was sanctioned by the Board in the case of 347 companies. There were during the year three applications granted for leave to pay interest out of capital during construction; and two of them were made by the Andalusia Water Company and the Seville Water Company. The total number of companies registered in the United Kingdom fell from 7425 in 1913 to 6214 in 1914; the decrease in the nominal capital of the companies registered in the latter as compared with the former year being from £157,186,653 to £113,251,583. The average amount of the nominal capital also fell from £21,169 to £18,225.

Dividend of the Gas Light and Coke Company.

The Secretary (Mr. H. Rayner) intimates that the accounts of the Company for the past half year show that, subject to audit, the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 4s. per cent. per annum, carrying forward to the next account the sum of £446,614 19s. 11d.

South Metropolitan Gas Company's Dividend.

We are informed by the Secretary (Mr. F. M'Leod) that the accounts for the half year ended Dec. 31 show that, subject to audit, the balance to the credit of the net revenue account will enable the Directors to recommend payment of the statutory dividend at the rate of £4 8s. per cent. per annum, carrying forward to the next account the sum of £23,968 3s. 10d.

A Record of Progress.

Well named, with this title, is an illustrated booklet prepared by Messrs. Fletcher, Russell, and Co., of Warrington, to emphasize some facts regarding the works and the history of the firm. In the first place, the reader is taken back to the well-known work of the late Mr. Thomas Fletcher, who as long ago as 1872 began the manufacture of gas apparatus in Museum Street, Warrington. Twenty years later, Messrs. W. & A. C. Russell, ironfounders, of Pendleton, Manchester, who made the greater portion of the castings used by Mr. Fletcher, amalgamated with him, thus forming the present Company. The booklet gives a description of the firm's works as they are now; and with this, and a series of photographs, it is possible to clearly follow the course taken by the raw material from its entrance right through to its finished state. A special department in the works is devoted to the manufacture of furnaces; this being a continuation of the work of Mr. Fletcher, who, it is pointed out, was the first to seriously take in hand the manufacture of small portable furnaces for the melting of iron and other metals. Mr. Fletcher was by profession a dentist; and it was as a hobby that he commenced the manufacture of gas appliances—fitting up his own house with gas cooking and heating plant. These primitive attempts were so successful that a demand arose among his immediate circle of friends for similar appliances; and this led him to commence in a small way the manufacture of articles for the use of gas for domestic purposes. Success came, and with it the works in Museum Street. From these small beginnings arose the present firm, whose name is known wherever gas is used.

PERSONAL.

Mr. Ernest F. Hooper has, after 25 years' intimate connection with tar and ammonia products, become associated with Mr. James E. Weyman, as bye-product specialists and chemical engineers, with offices at Pilgrim House, Newcastle-on-Tyne. As a Past-President of the North of England Gas Managers' Association, and a member of the Council of the Society of Chemical Industry, Mr. Hooper is in close touch with gas-works, as well as with the bye-products trade generally; and his long experience will doubtless be of great use in the developments now pending in the opening-out of the industry on broader lines than at present.

At the end of 1915, Mr. John Blackburn, Resident Engineer of the Colne Valley Water Company, completed 40½ years' service, having been appointed in 1875. The Company had then only been formed for about two years; and Mr. Blackburn watched the progress of the undertaking to its present dimensions and prosperity. From supplying a small area in Bushey, the Company have gone on growing until they now serve a territory of 76 square miles, including Harrow, Wembley, and district. Mr. Blackburn was originally Assistant Engineer to the Canterbury Water Company. Last week his colleagues presented him with a handsomely illuminated testimonial, recording his valuable services.

Owing to ill-health Mr. J. A. Young has retired from the managership of the Louth Gas Company, and the Directors have voted him a retiring annuity. During about eighteen years that Mr. Young has been at Louth, the consumption of gas has increased by over 60 per cent., and the quality has correspondingly improved. Within the last twelve years the price of gas has been reduced from 3s. 8½d. (net) to less than 3s. (net) per 1000 cubic feet, and further concessions have been made in the price for public lighting, and also to users of gas for motive power. In securing these results, the Directors have had the advice and co-operation of Mr. Young, who comes of a family of gas engineers who have rendered good service in various parts of the country. Mr. Leonard Birchmore, of Leatherhead, has been appointed, out of 85 applicants, to succeed Mr. Young.

OBITUARY.

The death is announced (as having taken place on Monday last week, at his residence) of Mr. William Thomson, the Chairman of the Cupar Gas Company. The deceased gentleman was in his sixty-seventh year.

The death took place on the 15th inst. of Mr. Thomas Wolferstan, a well-known Solicitor at Plymouth and for many years one of the Directors of the Plymouth and Stonehouse Gas Company. At the funeral at Walkhampton Church, last Tuesday, Sir Joseph Bellamy, the Chairman, and Mr. T. G. Greek Wills, a Director of the Company, were among the mourners, and the employees of the Company were also represented in considerable numbers.

Mr. Thomas L. Willson, whose death occurred in New York on the 20th ult., was best known in connection with his early work on calcium carbide, for the production of which and the formation from it of acetylene, he took out a number of patents about twenty years ago. In fact, it was while at Spray (N.C), during 1893-94, that he carried on a series of electro-furnace experiments, which finally led to the making of calcium carbide, and more or less accidentally to the discovery that the product, in the course of his experiments, gave off a gas which later on was analyzed and found to be acetylene.

Association of Swedish Gas-Works.

The only co-operation which has hitherto existed between Swedish gas-works has been that the managers and engineers have been personal members of the Swedish Communal Technical Association, which deals, among other matters, with gas-works' questions. At the end of last year, however, a Union of Swedish Gas-Works was organized, where questions concerning the gas industry will in future be discussed. Simultaneously with this general collaboration, the Swedish Gas-Works have put on a firmer basis an organization formed at the end of 1914, to watch over their particular interests. This coalition, entitled the "Svenska Gasverksföreningen," now includes the officials of 24 municipal gas-works, who formerly were able only to temporarily communicate with each other. They have all entered into the new union; and the few remaining works in Sweden are expected very soon to join it. The Council comprises five members; As Chairman, Mr. R. Dahlander, the Manager of the Stockholm Gas-Works; with Mr. R. Blomqvist, the Chief Engineer of the Stockholm works, Mr. A. T. Hall, the Chief Engineer of the Gothenburg works, Mr. H. M. Molin, the Manager of the Malmö works, and Mr. P. E. Aberg, the Engineer of the Helsingborg works. The "Statistics of Swedish Gas-Works" will continue for the present to be prepared, as hitherto, by the Swedish Communal Technical Association, mentioned above.

ELECTRICITY SUPPLY MEMORANDA.

Gas Companies and Electricity Supply.

THERE are two ways—the right and the wrong—in which people interested in the electricity supply industry can look at the question of gas companies engaging in the more or less pleasant pursuit of supplying electricity in areas in which a service is not already provided. The fact that there is not a supply in existence is *prima facie* evidence that the district has not hitherto proved an attraction for electrical enterprise to either the local authority or to those persons or companies who venture upon the promotion of undertakings in some of the smaller provincial areas. This fact furnishes a good starting place for the discussion of the question of the local gas company entering upon the supply. The electrical people, in their obfuscating hatred of all that has to do with gas, invariably look at the matter from the wrong point of view, and not the right one as to what is economically the best for the district and those who require electricity. The "Electrical Times," for instance, says: "From the electrical point of view, it is not, generally speaking, good business to confer electric-supply powers on people whose interest it is not to exercise those powers." The occasion of this queer utterance was in dealing with a suggestion of the Rugeley Gas Company as to applying for a Provisional Order to confer upon them electricity supply powers, authorization to the making of which application is embraced in their Act of 1900. The Company now think that the district is ripening for an electricity supply, though on a limited scale. They, however, recognize that there is little chance of the Board of Trade considering an Order this side of the end of the war; so they have opened the matter with the District Council in preparation for further movement, and invited their observations on the question of proceeding with a scheme. The "observation" upon the matter of the Chairman of the General Purposes Committee is that "he thought that the proposal was the last thing the Gas Company would have taken up." The remark does not indicate whether he is pleased or disappointed with the Company's action.

Questions of Fact and Economy.

But as to the "Electrical Times" comment. Why should it not be to the interest of gas companies, after they have sunk capital in electrical plant, to do their best to make it earn a profit? If there is any meaning at all in the words of our contemporary, it is that it is to the interest of a gas and electricity company to prosecute their gas business as against their electricity business because there is more money to be made out of the former. Can our contemporary show us an undertaking in this country exercising both gas and electricity supply powers that is engaged in such a piece of lunacy as working to prevent its electricity supply undertaking paying, and operating to the best advantage to both itself and its patrons for electricity? Many of the large electricity supply undertakings of the United States are run by what were originally concerns supplying only gas, and, of course, the secondary products of its manufacture; and no one can say that these companies have not given the electricity business full developing head. What is thought in America on the subject is partially stated in the article on p. 161 of the "JOURNAL" last week; and curiously enough the "Electrical Times" itself gives evidence of the push of combined gas and electrical companies in America, by, in another part of the same issue, referring to what is being done at Rochester (N.Y.) in supplying small electrical accessories, as treated upon in the two succeeding paragraphs. However, in this country the large and favourable areas are under supply; and the districts that are left are neither large nor favourable for electricity supply run independently. At the same time, the gas companies in them cannot afford to share with another undertaking what light, heat, and power business there is going; but it does not matter to the gas company whether the business is secured for gas or electricity generated by gas at holder-cost, or by steam produced by the utilization of coke breeze. It is all a question of economy. Can an electricity undertaking be run more economically by a gas company having land, fuel, and staff—technical, clerical, and outdoor—already available, or by a separate concern with none of these things to its advantage, and which would therefore have to charge more for current in order to compensate for the relative disadvantages? If it can be, then the consumers must benefit. If electricity can be supplied cheaper by a gas undertaking in existence, than by a company starting *de novo*, and having all the additional expenses to meet due to its individual life, then the lower cost must be a factor in helping the progress of the electricity business in that particular area.

Small Accessories.

Under "Cooking and Heating Notes" in the "Electrical Times," an article has appeared calling attention to the value—owing to the diversity of consumption promoted, and the introduction that they give to the use of the heavier class of domestic apparatus—of encouraging and developing the use of such goods as electric irons, coffee-percolators, toasters, table-grills, shaving-pots, and the like. It is remarked that if a consumer is pleased with the results obtained with a table-grill, with a coffee-percolator or with a toaster—"*and he cannot fail to be*"—he is then in a state of mind to listen to a suggestion that he should instal a complete cooker. The words "and he cannot fail to be" find significant comment in the succeeding article, which is headed "Unused Accessories." The writer there says that these accessories sell freely; but, he asks, do they remain long in use after they have been bought? He appears to be overwhelmed with the gravest misgivings. Their novelty, he observes, no doubt causes them to be used regularly at first; but it seems that the inherent qualities of the accessories cannot, on the slightest trouble arising, sustain them from falling into disuse. "If any trouble arises with them, the owner, not regarding them as indispensable, will allow them to continue out of commission. . . . We think that very often he uses a device until it breaks down, or gives trouble through a broken connector or worn-out flexible cord. It is then put away into a cupboard and ultimately forgotten." The very people who so ill-treat these electrical goods are those who, it is supposed, cannot fail to be enamoured of them. We are afraid that in a good many cases, there is mis-fire, and that the advent of trouble does result in the disposal of the broken-down piece of goods among the forgotten trifles to be found in every household. Instances of this sort of thing are known to us. One good lady of our acquaintance has electrical novelties of the kind. They are carefully preserved for use when she wants to make a "show" on occasions when visitors are in the house. When only the members of the family are present, the old, simple, and less expensive ways of doing the same things are followed—generally by the aid of an excellent all-round gas cooker, which stands in the kitchen adjoining the dining-room sturdy and reliable, and capable of supplying all the wants of the family at a most economical rate, and without the slightest trouble.

Their Running Cost.

Returning to the first article, some data are cited as to the cost of running certain of these accessories in a couple of houses in Rochester (N.Y.). This is going a very long way for information. The lesson the figures contain is that, running these domestic accessories off a lighting circuit, as is necessary unless an electric-cooker or electric-fires are in use on a different circuit with current supplied at a lower price, a fairly considerable addition is made by them to the household expenses—if the old system of doing the same things is still available, as it usually is, through being required for other purposes.

—	House.	Flat-Iron.	Percolator.	Washing Machine	Vacuum Cleaner.	Toaster.
Weekly hours of use.	No. 1	2·50	2·75	4·25	2·10	—
	No. 2	2·43	4·38	3·48	1·15	0·05
Power consumption in units . .	No. 1	2·81	1·51	0·935	0·68	—
	No. 2	1·34	1·71	0·80	0·13	1·19
Cost at 4d. per unit	No. 1	11·24d.	6·01d.	3·74d.	2·7d.	—
	No. 2	5·36d.	6·84d.	3·2d.	0·52d.	4·76d.

Our contemporary points out that the weekly revenue from house No. 1 for the accessories, apart from that produced by lighting, was 23·69d., and from house No. 2 20·68d. If these figures be taken as the average for a week throughout the year, the annual revenue would be £5 2s. 8d. and £4 9s. 7d. respectively. These are not negligible sums for most householders, who would see in them a substantial waste to supplement the ordinary fuel bill.

Flat-Rates and Reductions for Quantity.

That the numerous tariffs for electricity, unscientifically devised, and with such false bottoms as the rateable value system, increase in incompatibility with the advance in abnormality, is being evidenced at the present time, and particularly in places without a decent industrial demand. Brighton supplies illustration; and yet we do not think the Corporation Electricity Department has gone to the length of certain other undertakings in the variety of tariffs adopted. In fact, we do not remember that the Engineer and Manager (Mr. John Christie) ever went in for the rateable value system. If he did, it has escaped recollection. However, it went the round of the papers last week that, in addition to a loss of about £7000 revenue by reason of the restrictions on public lighting, the decreased consumption in private houses and business establishments, the management at Brighton has to face an alarming increase in the cost of generation, consequent upon the rise in the price of coal and the inferior quality that is being delivered. A deficit on the year's trading is inevitable; and Mr. Christie, it is stated, reports that next year "the position of the undertaking will be most serious, unless the revenue is substantially increased." We remember a very good dividend having been declared by the Brighton Gas Company at their last half-yearly meeting. Under such perturbing circumstances for the Electricity Department, Mr. Christie recommends a drastic course as the only means of securing alleviation. He proposes, the report states, the abolition of all existing lighting contracts, and the substitution of a flat-rate commencing at 5½d. per unit for the first 1000 units, and decreasing ½d. per unit for each additional 1000 units—the minimum being 3½d. per unit for all consumption over 4000 units. The charge for energy for the tramways, it is suggested, shall be raised from 1·35d. to 1·4d. per unit; but other power contracts are to remain undisturbed. In the extremity of the concern, it takes refuge in the good old-fashioned plan of charging on the flat-rate, with reductions according to quantity taken. There are those artizan dwellings which use an average of only 26—not 1000—units per

year, and pay 6d. per unit, including meter charges and lamp renewals, while the other capital and maintenance costs, it is understood, fall upon the Health Committee. These people are surely being treated on preferential terms under the proposed new conditions; and how is Mr. Christie intending to comply with the law in their case? Perhaps he explains in his full report; we cannot tell, seeing that we have not been favoured with a copy. Perhaps it is not considered that we deserve one. The tariff recommendations came before the Town Council last Thursday, but were referred back. There was much discussion; the feeling being that the small consumers were not being fairly treated in being asked to pay 5½d. per unit against 3½d. by the wealthy large ones. There was also some demur to the bulk of the additional revenue being placed upon the private consumer. There was also a proposal that £2000 should be paid from the rates to the Electricity Department on account of the capital loss the undertaking had been put to owing to the street lighting not having been maintained. Some one jocularly asked how much the Council were going to pay the Gas Company, who are also suffering from reduced public lighting. The question was lost in space. Private enterprise has to fight its own battles; municipal enterprise is nursed at the expense of the general ratepayers' pockets.

Summer Deficits and Winter Recuperation.

There is a dual interest in the report which Mr. J. Horace Bowden, the Engineer and Manager of the Poplar Borough Council Electricity Department, has presented to his Committee on the results of the working of the second quarter of the present financial year—that is to say, the quarter ending in September. There is, in the first place, good cause for congratulating him upon the net result, and there is, in the second place, cause to compliment him upon stating in black and white a fact which is obvious from the accounts of many electricity undertakings, but is, with beautiful *sang-froid*, invariably denied or else hidden by those interested. Mr. Bowden states: "In former years, and in the case of almost all electrical undertakings, the summer half of the year has invariably shown a large proportional deficit, which is made up in the winter half by the sale of high-priced units for lighting purposes." The burden-bearing high-priced lighting units deserve the everlasting gratitude of the managers of electricity concerns; for without victimizing the lighting consumers they would never have been able to dabble in vicious tariffs as they have done in order to try to attract custom for other purposes. Mr. Bowden is not in favour of the rateable value system; but he prefers (if we recollect correctly) to take the maximum kilowatt demand as the basis for the lump-sum charge, which is supplemented by a small charge per unit. For years he has advocated that, given a scientific system of charging, the summer quarters should show a fair proportion of net profit; and he considers that his opinions are fully vindicated—and no one can gainsay him on the available figures—by the net surplus of the half year (£3358), which is greater than the average of the first twelve whole years of working. Till last year any profit made in the summer quarters was negligible; and in former years a deficit was invariably shown. The net surplus for the last June quarter, however, was £1286; and for the September quarter, £2071—making a total of £3357 for the half year. The corresponding figures for the same periods of 1914 were June £871, and September £1536—making a total of £2407. Therefore, the increase last half year was £950. War conditions did not prevail in the June quarter of 1914; and, taking this into account, the figures last half year are the more noteworthy. The higher coal prices, it has been estimated, affected profits by £2835; the net revenue account suffered by £600 owing to Stepney not taking a stand-by supply; the costs of other materials, pay to dependants of men on active service, and war bonus to the staff account for £436. These three items make a sum of £3871. On top of this a revision of prices represents on the output a reduction of £522. Yet the net surplus is that named. Mr. Bowden has reason in the circumstances to be very pleased with the results, and the Electricity Committee with Mr. Bowden for his management of the concern.

London and Southern Junior Association.—There will be a meeting of the Association at the Westminster Technical Institute next Friday evening, when Mr. E. Stroud, of Holophane, Limited, will read a paper (illustrated by lantern slides) entitled "Modern Illumination as Applied to Gas Lighting." On Feb. 5, members will visit the works at Wandsworth of the Wandsworth, Wimbledon, and Epsom District Gas Company.

Gas or Coke Heated Furnace for Explosive Shell Bands.—The "American Machinist" has given an illustrated description of an automatic shell-band heating furnace, built by the August Muffle Furnaces, Limited, of Halifax. It is stated that eight copper bands can be heated per minute for 4·5-inch high explosive shells, with a consumption of 3 cwt. of gas-coke per twelve hours. The copper bands are fed in the furnace automatically at the top through three slots; and owing to the rocking motion imparted to the furnace, they travel downward in a zig-zag course to the discharge ovens. The furnace can be heated either by solid fuel or by gas to suit requirements. The heat travels upwards around each side of the working chamber without coming into contact with the work itself. All the bands, it is said, receive exactly the same amount of heat treatment.

GAS FOR STUDIO PORTRAIT PHOTOGRAPHY.

In the report of the American Illuminating Engineering Society, published some weeks ago, there was an item to the effect that progress had been made in the production of mantles (for incandescent gas-burners) yielding a more actinic light, and, therefore, specially fitted for photographic purposes, where the chief consideration is obviously the chemical effect of the light upon the sensitive materials. In view of this application of gaslight, it may be of interest to publish the views of one intimately acquainted with photographic conditions, and qualified to point out the directions in which users of gas for the taking of portrait photographs may be most profitably sought.

Of late years, conditions and practice among portrait photographers have undergone very considerable changes. Artificial light for the taking of portraits in the studio has been largely adopted. In many cases, daylight is dispensed with entirely—the photographer thus being enabled to choose a place for his business which is in the heart of a shopping quarter or is upon the ground floor of a building. Usually in such circumstances it is no easy matter to obtain a studio which will be satisfactory with daylight as the illuminant.

Apart from this general adoption of artificial light, either wholly or partially, there has been a considerable change in the class of trade done by photographers. This change has been in the nature of a cleavage of photographers into two principal classes. The one is made up of the high-class men in the west-end of London, and includes, also, leading studios in provincial towns. The second, and by far the larger, class includes those undertaking "cheap" photography. By "cheap" is not implied that the portraits are of a low grade, for many of them are of exceedingly good quality. But the cheapness of photographic materials (at any rate, before the war), coupled with labour-saving methods, has made it possible to produce portraits at extremely low prices on a cash basis. This class of photography developed itself first in large centres, and has spread to smaller towns, and, since the outbreak of the war, has done enormous business in military camps themselves, or in small towns adjacent to the latter. One result of this cleavage has been the squeezing-out to a large extent of the middle-class photographer who, broadly speaking, has been compelled to come into line either with those of the high-class order or with the cheap men. If he has had any real artistic ability, he has cast in his lot with those obtaining high prices for high-grade work. But if his business instincts have been more in evidence than his artistic faculties, he has found it necessary to adapt his practice to that of the cheap photographers, and very likely has bettered himself financially by taking this course.

While the high-class photographers, almost without exception, make some use of artificial light, for the reason that many of their sitters come to them from Court or Society functions, the cheap man finds artificial light practically a necessity to his business—for the reason already mentioned, that it enables him to choose a good business "pitch," and further that it is free from the fluctuations (as regards strength and direction) of daylight, and thus enables him to systematize portrait-making to an extent which allows the work to be done by much less skilled labour. It is among the cheap class of photographers that gas as a source of light may be exploited with every prospect of success.

Hitherto by far the preponderant source of light has been electricity—chiefly electric arcs either of the open or enclosed type. Opinions are pretty equally divided as to which is the better system. In the case of open arcs, the light is generally entirely obtained by reflection, usually from an umbrella-shaped reflector. With enclosed arcs it is usual to employ the light direct, after ample diffusion through semi-transparent screens. Whichever system is employed—and both are adopted by the highest grades of photographers—the crux of the question is that two or three arcs provide a light of very great power which can be damped-down by reflection or diffusion, and still leave plenty of illumination of a highly-diffused kind, but yet of ample power for short exposures.

Other electrical systems which have been used to a very much smaller extent are a battery of six to eight much smaller enclosed arc lamps, as also mercury-vapour tubes. The latter have never found general favour with photographers, on account of the objectionable aspect which the sitters obtain under this illumination. Quite lately the nitrogen bulbs—popularly known as "half-watt" lamps—have come largely into use, though general experience is not yet sufficient to say whether they will displace arc lamps among those who use electric light in studios.

Although electricity has thus been the chief light employed in studio portraiture, it is not to be assumed that photographers are entirely contented with it. In the case of arc lamps, the sudden flickerings and spurtings of the arc are a serious drawback; while nitrogen bulbs give trouble owing to their fluctuations in actinic power, as a result of variation of the load. The actinic effect in these circumstances appears to be very much more affected than the visual effect, with the annoying result that plates may in consequence be under-exposed.

As regards the use of gas, there have hitherto been only two installations upon the market—one consisting of twelve upright incandescent burners staged in front of a bright metal reflector.

This lamp has been marketed by the Kodak Company. In the case of the other installation, twelve Howellite inverted burners are fitted in front of a metallic reflector mounted between a pair of uprights which permit the battery of burners to be raised or lowered. It must be admitted that neither of these installations approaches one or two arc lamps for short exposures or to allow of the photographer taking small groups in the studio.

It may be of value to outline the requirements in a studio lamp —premising that it is used by the "cheap" photographer. The high-grade studios almost invariably exist in centres supplied with electric current, and at the prices which they obtain, the cost of installing and running artificial light is a minor consideration, while their long experience with electric light would make it difficult to wean them to any other, even if it could be shown to be superior. On the other hand, the cheap man is now often in places where there is no electric supply, and his requirements are of a less exacting order.

The chief thing is the actinic or chemical intensity of the light. The visual power obviously is of no importance. The photographer wants a light which at a distance of (say) 6 to 10 feet will illuminate a single full-length figure or a group of (say) three people in such a way that a softly lighted portrait can be taken in a second at most—better in a half or one-quarter second. To give definiteness to this formula, let it be said that the lens will often have an aperture of f/6, although in many studios lenses of f/4 aperture are used—permitting exposures one-half of those with f/6. The plate generally employed is not the most sensitive obtainable, as these are more costly and more difficult to handle. The plate of speed designated as 300 H. & D. is most commonly used—a favourite brand among the cheaper class of photographers being the Kodak "Royal Standard." These particulars are sufficient to enable any maker of a studio gas-lamp to discover for himself whether his apparatus will comply with general working requirements.

Next in importance is facility for switching the light on and off by means of a bye-pass, or some form of distance light-controller. This is particularly necessary with lamps which throw out a considerable amount of heat, since many cheap businesses are run in positively confined quarters.

It is also necessary for means to be provided for placing the lamps as high as possible in the comparatively low rooms which are often used for this class of business. This condition points to the use of inverted burners, and to the avoidance of unnecessary construction above the actual light. Usually, in portrait photography, the light needs to be at least 8 feet from the ground; but it is necessary to have the facility of raising or lowering it smoothly and without physical exertion, in order to deal rapidly with different sitters and to secure different effects. In some cases the lamp may be a fixture in the studio; in others, it requires to be movable.

The colour of the light—presuming that its actinic effect is ample—is a minor point; but there is a psychology of portrait-making of which perhaps the chief element is that the illumination at the time of taking the portrait should present the sitter in a favourable aspect. Often the sitter is accompanied by a friend; and if she (it is usually a she) sees her friend looking at her best in the studio light, she assumes unconsciously that the portrait of herself will, let us say, do her justice. It is a fact that photographers have for this very reason preferred to use open arc lamps rather than the more bluish light of the enclosed arc.

Coming now to the market which exists in this country for portrait lamps in photographic studios, it is estimated that there are from 8000 to 9000 photographic studios in the United Kingdom, of which perhaps 7000 to 8000 come under the category of "cheap." Undoubtedly a great many of these at the present time use only daylight, since many of them are in places where there is no electric supply and have found the gas-lamps hitherto available insufficient for their purpose. On the other hand, a very great number now employ artificial light, when the state of the weather or the time of day renders it necessary to do so; while a still smaller proportion employ artificial light to the exclusion of any other. In considering the outlook for cheap photography in the future, it may be predicted that among the working classes there will be more buyers of cheap photographs than hitherto. Among the philanthropic movements which have arisen in consequence of the war is one organized by the "Y.M.C.A." for the making of portraits of the wives, parents, and children of men with the Army and Navy, either on active service abroad or in camps in this country. Tens of thousands of these photographs have been made by honorary workers at the homes of our men; and hence there is reason to think that the habit of being photographed will receive an impetus among the lower classes of the population. Whether this prediction be justified or not, it is certainly a fact that the present tendency in photography is to seek sitters from the masses of the population, and to offer them photographs in postcard and smaller sizes at prices which are a fraction of those which would have been considered possible a few years ago. Artificial light is the chief necessity in this class of business, since these sitters, drawn from the working classes, have not the opportunity of coming to a studio in the hours of daylight. Hence there is undoubtedly a market for studio portrait lamps in the many smaller towns where electric supply is not available, or even in places where it is—provided a lamp of sufficient power and general suitability could be offered to the photographer and properly fixed by the local gas company at a cost of (say) from £5 to £10.

It is perhaps possible with these facts of photographic conditions before them that one of the makers of high-power burners could devise an installation which would supply the photographer's wants, and even prove a competitor with the electric sources of light. Apparently, one of the chief factors in the case is the provision of a special form of mantle yielding radiations which are of greater chemical activity than those in common use.

GERMAN ILLUMINATING ENGINEERING SOCIETY.

Second Annual Meeting.

THE official report of the proceedings at the second annual meeting of this Society, which was held at the Physical-Technical Institute at Charlottenburg on the 23rd of October last, appears in the "Journal für Gasbeleuchtung" for the 8th inst. The following particulars are abstracted from the report.

The attendance at the meeting numbered fifty-three. The President of the Society, Dr. Warburg, of Charlottenburg, made a few opening remarks, in which he referred to the fact that the meeting was the third which the Society had held since the outbreak of war. He said that since the last meeting, the bitterness of the combatants, both those at the front and those behind it, had increased, especially among the enemies of Germany. The purely scientific journals, German, English, and French, however, were free from the war taint; and he therefore was hopeful that when peace was restored ways would be found for the co-operation of all civilized countries on questions of general interest to humanity. Their Society had been founded partly for international intercouse, and the future alone would show whether it would be able again to take up this side of its work.

The Secretary (Dr. Liebenthal, of Charlottenburg) then presented the report of the work of the Society, which he said had been founded on Nov. 2, 1912, and held its first annual meeting—which was also the first general meeting—on Feb. 24, 1913, in Berlin. Three Committees were then appointed to deal respectively with the "Unit of Illuminating Power," "Nomenclature," and "Methods of Photometry." The second annual meeting had been fixed for Sept. 19, 1914, at Nuremberg, but was deferred on account of the war. Ordinary meetings, however, had been held, making seven meetings in all, exclusive of the present annual meeting, at which a total of 21 technical and scientific papers had been read. The Society had become the National Committee for the representation of Germany on the International Committee on Illumination.

THE UNIT OF LIGHT.

The report of the Committee referred to above on the "Unit of Illuminating Power" was presented by Dr. Hagen, of Charlottenburg. The Committee had discussed a report by Dr. Liebenthal dated March 20, 1913, on the "International Unit of Light," which reviewed the position of the question. The Committee agreed unanimously that this report could not as a fact be the subject of a resolution, and that efforts should first be directed to maintaining the unit of light constant, as had been done in France, England, and America. A member of the Committee undertook to get in touch on this point with the people concerned. He had made one report on his inquiry, and would have made another had not the outbreak of war rendered it impossible to pursue the matter. Regarding this report, Dr. Warburg remarked that all were agreed that the present units of light were merely provisional, and that it was desirable that they should be replaced by a rational unit. Such a unit could be based on the radiation in a hollow chamber, and the Reichsanstalt was investigating this question. Two technical Associations had provided the Society with funds for the purpose. If the unit were based on the radiation in a hollow chamber, it would be necessary to fix on a temperature which could be reproduced with certainty. For metallic filament lamps a high temperature must be chosen—viz., about 2000° C. The method of Lummer and Kurlbaum, of reducing the total radiation to a known fraction by means of an absorber, was first employed for fixing the temperature. It had been found that at 2000° C., a rise of 1° in temperature corresponded with an increase of 0·5 per cent. in the light; consequently if the light had to be exact to 0·5 per cent., it must be possible to reproduce the temperature within 1°. This had indeed been found quite possible. Formerly use had been made of the carbon radiator of Leithäuser and Warburg; but it had been necessary to see whether other radiators and measuring instruments would always afford the same result. Another radiator had been obtained, but, as supplied, had been found to be altogether unusable. It had been necessary to break-off the work on account of the dearth of metal.

NOMENCLATURE.

Dr. Strecker, of Berlin, in presenting the report of the Committee on "Nomenclature," said that the Committee had met twice in March, 1914, and had considered the proposals on Nomenclature and Standards put forward by a Committee of the Illuminating Engineering Society of New York, and a report on them which had been prepared by Dr. Liebenthal. After exhaustive deliberation, the members present agreed to certain proposals, which were then communicated to the other members of the Committee, one of whom took exception to them. On account of his objections and the outbreak of war, nothing further had been accomplished; but

as finality could be attained only by agreement with other countries, this delay was not, in the circumstances now prevailing, of any moment.

PHOTOMETRY.

Dr. Brodhun, of Charlottenburg, presented the report of the Committee on "Photometric Methods." This Committee originally comprised twenty members, of whom two—Professor Hartmann, of Frankfort, and Dr. Rasehorn, of Berlin—had died. Three questions had been submitted by the Council for the consideration of the Committee.

The first question was the "Estimation of Sources of Light," which involved the establishment of rules by which the light from sources could be determined in the simplest manner. Very divergent views on the matter were held by members of the Committee. Some wished to express the value of all sources by their mean spherical illuminating power; others by the lower hemispherical illuminating power. Others again were of opinion that it was impossible at present to adopt one uniform mode of expression. Finally, however, the Committee agreed on the following points, which had been communicated to the Society at an earlier meeting.

DETERMINING SOURCES OF LIGHT (EXCLUDING SPECIAL LAMPS).

A source of light is to be determined by one of three values—viz.: (1) The mean spherical illuminating power, I_o; (2) the mean lower hemispherical illuminating power, $I_{\supset}$; or (3) the mean horizontal illuminating power, I_h. The result must be so expressed that there can be no doubt which of the three values is meant.

From the purely physical point of view, the mean spherical illuminating power is the most important.

For practical reasons it is frequently not feasible to depart from the determination, which has hitherto been customary, of the mean horizontal illuminating power, or the mean hemispherical illuminating power.

The Committee, therefore, recommend the addition to the figures representing the latter values of the factor for their conversion to the mean spherical illuminating power.

It is not pretended that the adoption of these recommendations will entirely settle the matter; but they constitute a first step towards an understanding.

The second question referred to the "Determination and Measurement of Illumination." The same difficulties presented themselves as with sources of light. Some members wished to adopt the horizontal illumination E_h, others the vertical, E_v, while Dr. F. F. Martens proposed to take into account the mean vertical illumination and the mean illumination from all sides. There were also many difficulties which it would be useful to settle in connection with the measurement of illumination. For instance, it was not immaterial what type of receiving disc was used, or at what height the measurement was made. Herr Bechstein, of Berlin, had carried out investigations for the Committee on the effect of screening the observer in measurements of illumination, and had presented a paper on the subject. The Committee had not yet concluded its deliberations on this point.

The third question was the valuation of motor-car lighting, and experiments on it had been carried out for the Committee by Dr. Löwe, of Messrs. Carl Zeiss, of Jena, under whose chairmanship a Sub-Committee had been formed. The war, however, had broken off this work.

The Chairman thanked the Committee for the work which they had done, and referred especially to the importance of the question of the measurement of sources of light. Each Association had its own Committee, and gas engineers made rules for the testing of gas-burners, and electrical engineers rules for electric lamps, while the Society dealt with sources of light in general, irrespective of their description. Nevertheless, any recommendations made by the Society would have no practical value if they were not accepted by the other Committees; and hence it was desirable that the Society should keep in close touch with the latter. Arrangements had been made for active co-operation with the Society of the General Secretaries of the two large technical Associations—viz., Dr. K. Bunte and Herr G. Dettmar.

OTHER BUSINESS.

Herr Carl Schaller, of Berlin, presented his report as Treasurer on the finances of the Society since its foundation. There were 240 members in 1913, 261 in 1914, and 250 in 1915. The total receipts up to Sept. 30 amounted to about £420, and the total expenses to about £176, leaving a balance in hand of about £244, of which £125 had been invested in German war loans.

Dr. Warburg was re-elected President; and it was decided that the present Council and Committees should continue to act for the duration of the war. It was agreed that the next annual general meeting should be held at Nuremberg.

Two papers were then read—viz., by Dr. Voege, of Hamburg, on "Further Development of Objective Photometry by the Aid of Electric Alkali Cells Sensitive to Light, and their Use for Measuring Illumination," and by Dr. Lummer, of Breslau, on the "Aims and Range of the Art of Lighting, and New Methods of Determining the Temperature of Radiants, especially of the Sun." The last-named paper was discussed by Herr A. Meyer and by Dr. Warburg.

The meeting then terminated.

SIXTY YEARS AGO.

From the "Journal" for January, 1856.

High Prices of Materials.—The existing pressure upon gas companies, arising from the high price of coals, without an equivalent advance in the residual products, has been to some extent mitigated during the past year by the enormous increase in the consumption of gas, consequent upon the high prices of oil and tallow; and, instead of the usual increase of 8 or 10 per cent. per annum, the consumption of 1856 bids fair to exceed that of 1855 by 20 per cent. Unless, therefore, timely provision is made for this increase, such gas-works as are already taxed to the full extent of their powers run the risk of breaking-down in the midst of prosperity. At the present moment, more than ordinary difficulty is experienced in the execution of orders for castings and machinery, in consequence of so many foundries being filled with Government contracts; and many instances came under our observation last year, where engagements entered into for works imperatively required for this winter's service, and which ought to have been completed in August, are still incomplete, in spite of penalties amounting almost to the value of the work undertaken.

The Management of Retorts (A Letter signed "L. T.").—It has often appeared to me that, in theory at least, there is a circumstance connected with the charging of gas-retorts which is incorrect. Thus the entire oven, or setting of five or seven retorts, is charged all at once, and a large mass of cold material in this way projected, as it were, upon the fire at the very time when the heat is most needed. Again, after a time, the whole of its material having become hot, and parted with much of its volatile matter, no longer requires the amount of heat so indispensable in the first instance; but just at this very time, and from this very cause, the heat of the whole setting accumulates and increases, by which, I fear, mischief of another kind ensues. In the beginning, the demand for heat being greater than the supply imperfect carbonization arises, or, in other words, tar is produced. Towards the end, the heat formed exceeds the demand; and then decomposition of gas, or, in other words, carbon is produced. It would be, I think, an interesting inquiry to ascertain the effect of working the retorts singly, at intervals of an hour each; or where this could not be done, of working half the setting at a time on a 2½-hour system of charging, so as to separate the intervals of calorific demand upon the oven into five or two portions respectively. The first system would seem best adapted for Boghead and other cannel coals; the second for common Newcastle coals. There ought theoretically, by this arrangement, to be a larger production of gas of a higher illuminating power, a smaller production of tar, and a less consumption of fuel. Will any of your numerous readers try the matter practically and report upon it?

IRON CARBONYL IN WATER GAS.

American Experiments.

Mr. Leonard M. Liddle, of the Pittsburgh University, states that, in the course of some recent experiments, a constant easily-regulated supply of CO was required; and hydrogen being in no way detrimental, a steel cylinder of compressed water gas was used. The presence of iron in all parts of the apparatus was soon evident, and could not be explained by a mechanical introduction in the slow stream of gas. The presence of $Fe(CO)_5$ seemed to be the most reasonable explanation.

Accordingly, a slow stream of the gas was passed through a glass tube, heated to about 250° C.; and a metallic mirror formed almost instantly. It had the appearance of an antimony mirror, but test showed it to be pure iron. Iron was determined quantitatively by passing a measured volume of the gas through a tube heated in five zones by small flames. Between each zone was a small plug of glass wool. It was found necessary to use these plugs, as the iron is formed as a fine dust, and is unavoidably carried out of the tube. The decomposition of the iron carbonyl was so complete that the first three plugs contained practically all the iron not deposited as mirrors. The iron was dissolved in HCl, oxidized with HNO_3, and determined as Fe_2O_3 gravimetrically. A volume of gas equivalent to 7550 cc., at standard pressure and temperature, gave 0·057 gramme of Fe_2O_3. Calculating the weight of the water gas as about 0·85 gramme per litre, the $Fe(CO)_5$ comprises 2·2 per cent. by weight, but only 0·212 per cent. by volume.

He concludes that water gas compressed in contact with iron should be tested before use in experiments. It has been assumed that the iron carbonyl is $Fe(CO)_5$, though the fact that it was necessarily formed in the absence of light might give $Fe(CO)_7$.

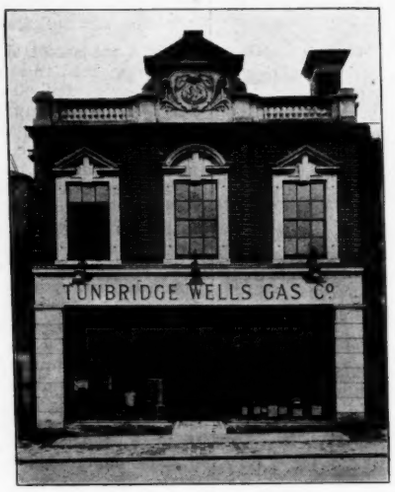
It was stated in the column of "Personals" last week that Lieut. CLIVE GRIFFIN (only son of Mr. William Griffin, the Secretary and General Manager of the Folkestone Gas Company) had been awarded the Military Cross for his services with the R.F.A. We have since learned that Lieut. Griffin has more than once distinguished himself; but the exploit which won for him the Military Cross was the unloading of an ammunition waggon which had caught fire. This work was successfully carried out, at great risk to the gallant young officer.

A FORWARD POLICY AT TUNBRIDGE WELLS.

Gas Company's New Offices and Show-Rooms.

If, as we are told, "'tis not in mortals to command success," those responsible for the administration of the affairs of the Tunbridge Wells Gas Company have evidently done more—they have deserved it. And the history of the undertaking, to which reference will presently be made, shows how amply their efforts have been rewarded. Beginning in a small way, the business has never ceased to grow; and the policy pursued has proved no less satisfactory to the consumers than to the shareholders. That this growth will continue for many years to come—whatever may be the temporary effect of prevailing abnormal conditions—must be the settled conviction of anyone who informs himself as to what is being done. Such an opportunity occurred last week, in connection with the opening of new offices and show-rooms; and the following notes of what was gathered on that occasion will indicate how well the community are being served, and how strong is the determination of the Board, and those who are associated with the distribution side, to keep well to the forefront the claims of the gas which is sent out at so reasonable a price from the works.

It was on Wednesday afternoon that the opening of the new offices and show-rooms took place; there being present at the ceremony some 170 guests, including many influential professional and business men living in the locality—members of the Town Council, doctors, architects, builders, and ironmongers—as also their wives. While enjoying the music of an excellent orchestra, an inspection of the new arrangements was made; and this was followed by afternoon tea, served in the Board-room. On all sides expressions of well-merited admiration and congratulation were heard, which must have been extremely gratifying to the recipients.



Early History of the Company.

Before referring in detail to the new premises, it may not be uninteresting to sketch briefly the early history of the Company, and the events which have led to the new developments. Originally, the town was supplied with gas by a private individual named Berry; but as great complaints were made with regard both to the adequacy of the supply and the quality of the gas, a public meeting was called on Nov. 1, 1842. At this meeting over a hundred persons were present, which was a large gathering at that time; and the outcome was the formation of a Committee to see what could be done to improve matters. The then existing works were sold to the Committee for £3700; and the Company was formed in 1843, with a capital of £5000, to take over the control of the gas supply. At the present time, the capital is about £191,000.

This is a big increase; but the growth of the gas consumption has been far greater in proportion. In the year 1844, which was the first completed year of the Company, the gas was supplied at the rate of 11s. per 1000 cubic feet; and the receipts from the sale of it amounted to not quite £1700, representing nearly 3,000,000 cubic feet. Compared with these figures, in 1914, the period covered by the last-published accounts of the Company, the price charged to the consumers in Tunbridge Wells was 2s. 6d. per 1000 cubic feet, and the receipts from the sale of gas amounted to £43,550, representing a consumption of 353,637,000 cubic feet. The prices quoted show how greatly to the benefit of the consumers the progress of the Company has been. It is true that, in consequence of the effects produced by the war, it has so far been found necessary to increase the price of gas 2d. beyond the low rate of 2s. 6d. per 1000 cubic feet previously existing—making it 2s. 8d.; but this, of course, has been quite unavoidable.

The Forward Policy.

Looked at in every way, the career of the Company has been one of continuous success; and this is the natural outcome of the progressive policy adopted by the Board. The interests of the consumers have always been carefully studied. In 1893, the prepayment system was adopted for the purpose of supplying gas to the smaller houses; and this convenient method has been largely taken advantage of by the inhabitants. Then some years ago the incandescent burner maintenance system was adopted; and a further subsequent development in this direction has been in the arranging of periodical visits to consumers in connection with the proper upkeep of gas fires and cookers; the Board rightly believing in the principle of approaching the consumers and attending to their wants, in preference to leaving them to grumble or make complaints at the gas office. This is the proper spirit; for certainly a satisfied consumer more than repays any slight extra trouble that may in this way be incurred. And while thus looking after the consumers, it must be added that the Board have by no means lost sight of the interests of the employees; the Company having been one of the first twelve in England to adopt the co-partnership system, thereby inducing the men to take a more intelligent interest in their work, and enabling them to share in the many benefits to be obtained by economical working in time and material.

The Veteran Chairman.

One of the interesting features of last week's function was the sketch of the Company's history as given by the veteran Chairman, Alderman W. H. Delves, J.P., who, in receiving the visitors, was supported by the other members of the Board (Messrs. R. Pelton, J.P., H. A. Beeching, William Stamford, Egbert Cronk, W. T. Trollope, Philip Ellis, and H. Thorpe), the Secretary (Mr. Charles F. Catt, F.C.I.S.), and the Engineer (Mr. Andrew Dougall, M.Inst.C.E.). To give such historical facts no one could have been better qualified than was Alderman Delves; for he first joined the Board in the year 1859, and has occupied the chair since 1887. Though well over eighty years of age, he is as keen and enthusiastic as ever; and with him at the helm, the steering of the Company's course is in thoroughly capable hands. While speaking of the length of time during which he has presided over the affairs of the undertaking, it may be mentioned that the Company has been exceedingly fortunate in this respect, inasmuch as since its formation in 1843 there have been only three Chairmen—Mr. Joseph Delves from 1843 to 1851, Mr. E. M. Hunter from 1851 until his death in 1887, and since that time the present Chairman.

After extending to the guests, on behalf of the Board, a hearty welcome to the new premises, Alderman Delves said he thought they would all agree that great credit was due to the Architect for the skilful manner in which he had made the most of his opportunities, and of the limited space at disposal. He then drew attention to a first-rate collection of the products of coal tar which was on view, partly loaned from the local Technical Institute, and partly derived from the Company's own works. From this, among other things, it was possible to judge of the similarity between natural indigo and that which has its origin in coal tar. The Chairman touched upon the importance of this exhibit from a patriotic point of view, and referred to an article which has recently appeared in the Press asking people as far as possible to use gas in place of raw coal, because of the toluol that will thereby become available for the manufacture of high explosives for our fighting forces. In the case of their own Company, he said, the coal which they carbonized in a day was sufficient to fill 250 3-inch shells. When they remembered how many gas undertakings there were in the country—many of them much larger than that at Tunbridge Wells—they would realize what an important position the industry occupied in connection with the manufacture of high explosives. Coming to the question of the slight increase which it had been found imperative to make in the price of gas, the Chairman showed how small an amount 2d. per 1000 cubic feet was, under all the circumstances, to add to the charge, and how well it compared with the advances necessitated in London and in many of their neighbouring towns. He told them that in 1914, just before war was declared, the Tunbridge Wells Company entered into a contract for their year's supply of coal at 18s. 7d. per ton, while the 1915 contract was fixed at 29s.—a rise of nearly 11s. per ton. This made a difference on the quantity of coal carbonized of some £12,000 a year; so that the rise of 2d. per 1000 cubic feet in the price of gas was very trifling when compared with the increased cost of coal. They would all do their level-best to carry on without a further increase in the charge; but he was not at the present moment very sanguine about being able to do so. When thinking over the matter, the consumers should bear in mind that, as the Company were under the sliding-scale, which meant that the shareholders' dividends were governed by the price of gas, the Board did not raise the charge for gas from mere fancy, but because they were impelled by stern necessity to do so.

The Mayor (Mr. C. W. Emson) then, at the request of the Chairman, formally declared the building open, and expressed

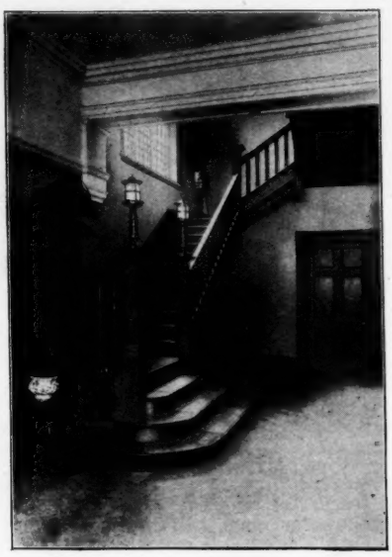
his great pleasure in doing so. He said the facts stated by the Chairman showed how efficiently the affairs of the Company were managed. Starting in very small circumstances, they saw to what dimensions it had grown; and it was still progressing. It had a worthy opponent in electricity in the town; but in spite of this competition with the municipal undertaking—which was a perfectly fair and reasonable competition—both concerns had progressed. The Gas Company not only had initiative, but they possessed the faculty of altering their policy to suit the changed condition of the times. The greatest credit was due to those concerned; and the town had every reason to be proud of the undertaking. Seeing how long the present Chairman had been in office, much of the success which the Company had attained must have been due to him and to his colleagues. On his own behalf, and on behalf of the town, he wished continued prosperity to the Company, and long life to the Chairman.

The New Offices and Show-Rooms.

The offices of the Company were originally at the Secretary's residence; but in 1876 premises at No. 44, High Street were taken for the purposes of the business—the old office being altered and adapted to meet the varying conditions from year to year. In course of time, however, the expansion of the business necessitated the adoption of a more radical scheme than this; and it was decided to rebuild on the original site, which occupies an excellent position in the centre of the main thoroughfare of the town, midway between the two railway stations. Temporary premises were secured at the Pantiles for offices and show-rooms; and there the business has been carried on during the re-building. The Architect for the building was Mr. Egbert Cronk, who is also one of the Directors of the Company, being thus doubly qualified for his task; and the contract for the work was given to Messrs. Thomas Bates and Sons, in September, 1914. The building itself is of red brick, and has stone facings—the lower portion of Portland and the upper Bath stone. The front of the premises is of classic design, and is surmounted at top by a balustrade, with a pediment in the centre having a carved stone date panel. The whole forms an imposing building. The outside lighting—when it is permissible to indulge in this luxury—will be by two 10-light and one 12-light Sugg "Littleton" lamps, of a total lighting power of over 3000 candles; but the control is so arranged that the centre lamp can be partly shut off, leaving only three burners alight, when there would be an illumination for the benefit of the thoroughfare throughout the night of some 270 candles. It may here be mentioned that the authorities of the Electricity Department had the "courtesy" in 1895 to place a large electric arc lamp immediately facing the front door of the old premises, within some feet of the entrance; but by arrangement with the town authorities this has now been removed—subsequent on an offer from the Company to provide an equivalent light for the public

during the usual lighting hours, reducing at night time, similar to the electric arc lamps. On the ground floor, there is a handsome oak and plate glass double front, with central entrance to the show-rooms and offices.

The show-room, which has a polished wood block floor, is 30 feet wide, with 14 feet pitch, thus allowing of a display of the different goods to the best advantage. On entering, the visitor is faced by a large glass case filled with the more elaborate kinds of silk and beaded shades, and on either side are square oak pillars, to the four sides of which gas-brackets—but not too many of them—are attached. From the ceiling are suspended a varied selection of gas-pendants, for direct and semi-indirect lighting, some live, and others attached by a special form of fitting which allows of their instant removal when required—and, again, there are not too many of them. In fact, in the entire fitting-up of the show-room one sees the strongest evidence of a wise determination to avoid the error of over-crowding. In the windows, gas-fires and cookers are shown, as they are also, in all their latest styles and sizes, round the room; smaller, but equally desirable, gas-consuming devices being placed on a shelf at a convenient height. On one side, too, there are a fitted porcelain bath and a lavatory basin, with a complete "Ironclad" water-heating installation and geyser, both in action. Past this tempting array—further evidence of good design—the consumer has to wend his or her way when wishful to pay an account in the clerks' office, which is really a continuation of the show-room, at the rear, the combined depth of this office and the show-room being 68 feet. Both show-room and the offices are well lighted and ventilated; and the wainscot oak used for the woodwork harmonizes exceedingly well with the contents.



The Secretary's office is situated in the rear of the clerks' office, and is approached, for convenience of access, either from the general office or by a corridor leading from the show-room, out of which suitable lavatory and cloak-room accommodation is provided. The engineer's office is also at the end of the corridor. A feature of the show-room is a massive oak staircase (with large mullioned and lead-light glazed window) leading from it to the upper floor, where there is a committee-room and a lofty board-room, about 31 feet by 19 feet, with chimney-piece and woodwork in oak, coloured walls, and deep frieze, below which are hung portraits of the late Mr. E. M. Hunter (at one time Chairman), Mr. W. H. Delves, J.P., the present Chairman, the late Mr. R. P. Spice (former Consulting Engineer), Mr. T. Fox Simpson (late Solicitor to the Company), and the late Mr. John Read (who preceded Mr. Catt as Secretary). The portrait of Alderman Delves, it may be added, was presented to him by the Directors, Engineer, and Secretary, in February, 1909, on the completion of his fifty years as a Director and twenty-one years as Chairman. Other objects of interest exhibited in this room is a replica of the shield from the Tunbridge Wells Tradesmen's Association for the best illuminated and decorated premises during Cricket Week in 1912, and the trowel presented by Mr. Spice to Mr. Hunter, who was at that time Chairman, for the laying of the foundation stone of the works which were erected in 1878. The lighting of the board-room is by a Sugg eight-burner ventilating light, with obscuring cut-glass bowl; the lamp, with the globe, giving an effective illuminating power of 400 candles. The control of the lighting throughout is on the by-pass switch system, operated by means of a lever-cock.

At the back of the building, on the first floor, and approached by a separate side-entrance and staircase, are convenient rooms forming a self-contained flat, which will be occupied by the Chief Inspector of the Distribution Department. The whole of the basement of the premises has been utilized for the carrying-on of the work of the Company in the matter of fittings and maintenance, and for meter-testing. A roomy space provided for receiving and packing is entered by large doors from the side-passage; and the gas-meter testing room, workshops with benches and fitted tools, stores and issue departments for the varied fittings required, and a suitable office for the Chief Inspector, all combine to form a fully-equipped workshop well able to keep pace with modern requirements, and arranged to prevent all avoidable confusion.

In view of the fact that this article deals solely with the distribution side of the business of the Tunbridge Wells Gas Company, it would be unfair to conclude it without reference to the services rendered to this branch of the undertaking by Mr. Charles F. Catt, as Secretary. He has been with the Company for over thirty years; and it is no more than an act of justice to ascribe to his initiative and business acumen much of the progress that has been a pleasure here to record.

[The photographs reproduced are from the Studio of Mr. Harold H. Camburn, of Tunbridge Wells.]

CHICAGO AND A CALORIFIC STANDARD.

Prospective New Gas Plant.

A tempting offer has been laid before the City Council by the People's Gas Company of Chicago, provided that the authority will agree to a calorific standard for the gas; the Directors declaring that, if the city is willing to co-operate with the Company by eliminating the "unwise high candle power requirement," this will allow the Company an opportunity to erect a coal-gas plant on property heretofore acquired for the purpose, and will thereby promote the possibility of future greater reductions in the price of gas. The erection of such a plant, with the regular extension of the Company's distribution system, would, it is stated, necessitate an expenditure by the Company of not less than $14,000,000 within the next three years.

When making this offer, the Board pointed out that for many years there has been a succession of controversies between the city of Chicago and the Company on the subject of rates to be charged to consumers. These controversies have never satisfactorily accomplished their object, but have caused much expense both to the city and to the Company and its predecessors. It is the Board's desire to bring the matter to a conclusion; and they believe this can be done by negotiation far more promptly and satisfactorily than by continued litigation. This being so, they suggested a conference between the parties, with a view of determining whether a schedule of rates can be evolved which will be mutually satisfactory. What the Directors would like to see established is a system of graduated rates which would tend to encourage the use of gas, not only for domestic purposes, but also by local industries, both small and large. Such a scale, they think, could be adjusted fairly and reasonably so as to result in reducing from time to time the selling price of gas, through reduction in the cost of its manufacture.

On the question of the standard, the Directors remarked that the constantly increasing price of oil, which is the factor of greatest expense in the manufacture of water gas now supplied by the Company, must inevitably call for an increase in the price of gas in the near future, unless the conditions surrounding its manufacture shall be so changed as to enable the Company to avoid the increasing cost. Gas in Chicago is now supplied according to a prescribed standard of candle power—the "highest to be found in any large city in the country." They believe this standard of quality to be unsound. A change of standard to a heat unit basis would permit the manufacture of gas without the use of oil, and would thus place the Company in a position to lower the cost and price of their product. Only a negligible percentage of the gas now consumed in Chicago is used through open-flame burners; and from the standpoint of efficiency and economy to the consumers, these old burners ought to be entirely discarded. They are as much out of date and as wasteful as the old type carbon filament lamp now is in electric lighting. The Public Utilities Commissions of Illinois, Indiana, Wisconsin, Pennsylvania, Washington, Oregon, New Hampshire, Missouri, Nevada, and the District of Columbia, after exhaustive study of the question, have adopted the heat unit standard; and other States are considering the change.

According to the "Gas Record" [Chicago] the public received the Company's suggestion very favourably; and it is believed that negotiations will proceed rapidly.

Mr. H. Lawrence Cripps, son of the late Mr. Henry W. Cripps, Q.C., lately a partner in the firm of Messrs. Dyson and Co., Solicitors and Parliamentary Agents, and at one time an Alderman of the London County Council, left estate of the gross value of £46,786. The will of Dr. Robert Sharp, who was Vice-Chairman of the Coatbridge Gas Company, has been proved at £31,853.

Miss Constance Crookenden, daughter of the late Mr. I. A. Crookenden, for many years Secretary of the Phœnix Gas Company, at the investiture held by the King last Saturday week, had conferred upon her the decoration of the Royal Red Cross. Trained at St. Thomas's Hospital, Miss Crookenden was for some time Matron of the Crays Valley Hospital and is now Matron of the Addenbrooke Hospital, Cambridge, and Principal Matron of the First Eastern General Hospital, at Cambridge.

NEW FEATURES AT THE DAVIS GAS EXHIBITION SALONS.

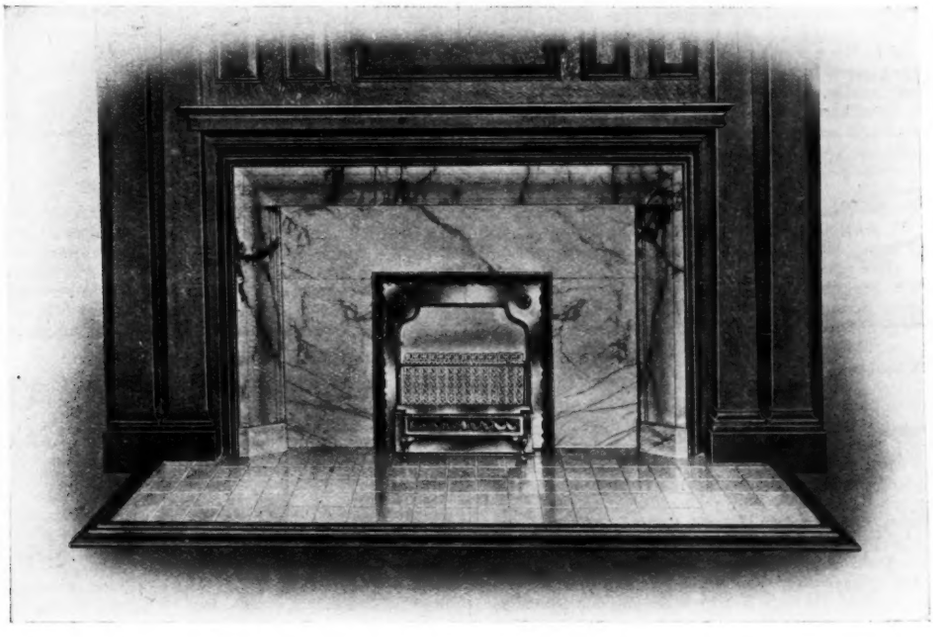
PASSING through Oxford Street the other day, the writer took the opportunity of repeating the pleasure of a previous occasion by having a walk through the Gas Exhibition Salons of the Davis Gas-Stove Company. It is not only a pleasure to visit these unrivalled gas show-rooms, designed and materialized by a robust enterprise, but there is perennial interest in them. It is rather more than eighteen months since the salons were opened; and the scheme has since developed into one of comprehensive perfection in respect of types, fitting, and display. Those responsible for this piece of excellent work have very definite aims and objects here. The highest standard that can be reached in any one respect is the standard that is maintained, and that it is intended shall be maintained. One result of this is that the place looks as fresh to-day as it did in those early days when order emerged from the chaos of construction, fitting-up, and furnishing. Everything looks clean and smart. There is no neglect; for it is a fundamental and closely observed maxim that a gas show-room should never be allowed to deteriorate, but if anything, like wine, should improve by the keeping, through having recourse not only to refinement, permanent cleanliness and orderliness, but to the improvements in types of appliances developed from time to time. A nice place attracts a lot of nice people; and that is what is being done at the Exhibition Salons—the "nice" being in this instance synonymous with "influential."

Among the people attracted are architects; and their souls are delighted, and their choice quickened, by seeing the fires in surroundings that appeal to their professional instincts. It is no use showing them a new type gas-fire in an old-fashioned, drab-looking mantel and background. They want to see the gas-fires framed in specimens of the things that they would themselves suggest to their clients as the materialization of the latest ideals in mantels; and the pleasure of the demonstration of actual appearance is transferred to their clients, by sending them along to the place where they can appreciate exactly what a gas-fire of a certain type will look like in various modern designs of surroundings and in the modern tastes in materials. Lately, there have been at the salons several changes in the architectural features of the fire surrounds, in order that the fires may be inspected in the latest styles, and in order, too, that there may be a good diversity in contrasts.

Change in display is observed in the entrance windows; and in most of the neat divisioned fireplaces in the main salon—divisioned so that the eye is confined to the inspection of one thing at a time—the latest types of the firm's fires are fixed. Always admired by visitors is the "ingle bay"—it is one of the chief of the many features of the salons. This oak-wainscotted room has an oak mantelpiece, with Pavanazzo marble architrave and panels, and a Hopton tiled hearth; and in this is set one of the firm's very latest types of gas-fires. It is the "Georgian;" and the artist has been skilfully at work upon developing the delicate embellishments. The photograph portrays it better than words. But it is a fire that is worthy of its setting; and the setting is worthy of it. Flush fitted in the setting, with its 18-inch front—a good broad, genial faced fire for large apartments—it will here make good its claims to consideration before next heating season comes round, when it is to be placed on the market. Just outside the "ingle bay," set in a slantwise mantel, is the firm's new "Diana" fire. It is a moderate priced fire for all situations in which a well-finished serviceable fire is needed. It has a well disposed canopy, burns silently, and yet, unlike some silent fires, the columnar fuel is beautifully incandescent in its length. "Diana" has a prepossessing appearance; and it is not surprising to learn she is in high favour.

Passing to the divisioned recesses, in which mantelpieces and surroundings of high character in design and material are found, with fires in them of various patterns and for different situations, we may refer to samples of the new work, which demonstrate the applicability of gas-fires to the best styles of work in "fireplaces." Here we have a very pretty thing in marble, which obtains its name of "Dove" from its delicate grey tint. Dove surroundings and hearth and Dove and statuary boxed moulded slips, with an "Adam" interior fire, form a combination that is very choice. Here, too, we have the "Pandora" nestling in a neat grey tiled surround, with curved back. The "Jacobean" fire shows its capacity for harmonizing with a nice setting of peacock blue tiles with Lunel slips. Another new type of surround is given by red crystallized tiles to the "Adapta" fire. This has a Jacobean mantel, and, with a semi-circular bronze curb, it has a very artistic appearance. There is also to be seen a very pretty effect with a "Georgian" fire similar to the one in the "ingle bay," but with an earlier type of trivet. This fire has a mantel and surround of pale green tiles. We must leave, with the reference to samples only, the excellent work and demonstration of the fitness of the gas-fire to any location and surroundings.

We pass down to the extensive basement. When last making an inspection, the scheme was not completed in this part of the salons. But it is now; and the architect, gas engineer, gas salesman, private individual, and manufacturer can each and all find practical exposition here, whether it be for fitting up the largest hotel or the cottage with gas-heated cooking arrangements of all kinds, or whether it be for fitting up the large business establishment, the mansion, or the houses in Suburbia with hot-water circulating boilers and adjuncts in connection with the coal range, or independently of it, or in conjunction with a gas-range. Blue prints hang alongside each showing the arrangement of all the connections, so that there is good instruction here for those who are contemplating adoption. Radiators are also shown fitted up to the hot-water system. Here also are most inviting bath rooms. Further along we come to strong, practical looking contributions from the firm's industrial furnace department. Here, too, are fires set in more modest surroundings than in the main salon, and a central display of the entire range of Davis gas-cookers. The large and diversified range of domestic gas-heated appliances seen here transfers the thoughts to the spacious foundry and shops at Luton from which all these representatives of the firm's extensive manufacturing operations have emerged.



DAVIS "GEORGIAN" GAS INTERIOR IN THE OAK-PANELLED INGLE BAY.

North British Association Motor Ambulance.—The North British Association of Gas Managers have been collecting subscriptions with the object of presenting the Red Cross Society with a motor ambulance. The vehicle has now been ordered, and is to be handed over to the Society on the 2nd prox.

EXTERNALLY HEATED GAS-OVENS.

The Question of Gas Consumption—Experimental and Independent Experiences with the Potterton "Sealed" Oven.

EXPERIENCE with externally heated gas-ovens is growing; and this experience is of a very satisfactory order. But there is something revolutionary in the idea; and revolutionary suggestions are apt to give rise to scepticism. But if the theories and the practices of the past are never to be subject to change, we should be a motionless people, and progress would never be achieved. This being so, when anything new presents itself, it is well, while we may be doubtful, to reserve condemnation until practical experience offers its support, or if it proves that our fancies bred of inexperience are wrong, then there will be gratification in having held one's peace.

Mr. Thomas Potterton, of the Cavendish Works, Balham, S.W., introduced some years ago his "Sealed" gas-oven with the gas-jets located on the outside, and the heat circulating, by regulated means, round the oven in the chamber furnished by it and the outer casing. Messrs. Fletcher, Russell, and Co., Limited, introduced, quite a distance of time ago now, the "Langham" hotel gas-oven, also externally heated, which is a piece of cooking plant on the large scale that has stood the test of time, and continues to give great satisfaction. Miss Helen Edden has designed a domestic oven with external heating, as described in the "JOURNAL" for Nov. 23, p. 429. There have been one or two other patentees; but their productions have not been placed on the market. Mr. Potterton has not made any particular effort to push his externally heated cooker. But it has been adopted; and in influential quarters it is pushing itself, and some excellent practical experience has accrued from its use. There are, however, sceptics as to any practicability or advantage over the ordinary form of gas-cooker; and the chief doubt that exists is as to whether there is any economy in regard to the consumption of gas. The statement of inexperience is that there is no such economy; the statement of experience is that there is. We have to thank Mr. Potterton for having placed at our disposal some figures not only derived experimentally, but from large scale work and independently; and these should conclusively set the question at rest.

The statement of the results realized with externally gas-heated ovens may be prefaced by saying that there are representatives in general use at the National School of Cookery, Buckingham Palace Road, S.W., as well as in private houses and hotels. But the greatest and most significant success is that the Aerated Bread Company, after making prolonged tests with an externally heated gas-cooker in comparison with an ordinary internally heated one, are now fitting the former at their new branches, as well as in existing depôts. The competence of the technical staff of the Aerated Bread Company for ascertaining the apparatus best suited, commercially and efficiently, to their large requirements will hardly be questioned; and, as stated, the result is in favour of the externally heated oven. This being so, this type of oven cannot be definitely dismissed as being of no account by people who are without experience of it, or who, being sceptical, make all sorts of random statements concerning it. Besides, the Aerated Bread Company, the Principal of the National School of Cookery pronounces the oven as being "very satisfactory;" and a letter from a hotel proprietor at Folkestone expresses the pleasure experienced in using the oven, and declares that it is a great improvement on the old style. He also mentions that the oven retains heat for a long time after the gas has been turned off. His view is that some steps should be taken to make the cooker better known among the public. This may savour somewhat of advertisement for a special form of cooker construction. It is not intended to be so. The intention is to show that there has been independent practical experience of a new principle in construction and method; and that this practical experience speaks very highly of the external heating of ovens.

TESTS BY THE AERATED BREAD COMPANY COOKING STAFF.

We will first of all give the results of tests made by the cooking staff of the Aerated Bread Company. Even the registrations of the gas consumption were made by a gas inspector of the Company, so that the tests all through may be taken as being wholly independent and the results reliable.

Test Made at the London Bridge Depôt, May 27, 1914.

Ordinary Oven.	*Potterton's Patent No. 3 "Sealed" Oven (Externally Heated).*
Gas lighted: 8·50	Gas lighted: 8·50
9·5 Beef (25 lbs.) placed in oven—Ribs, 18 lbs.; Buttock, 7 lbs.	9·5 Ribs of beef placed in oven. Two pieces weighing 21 lbs. 12 oz.
11.0 Buttock taken out.	
12.0 Ribs taken out.	12.0 Meat taken out.
Weight of meat after cooking: 16 lbs. 14 oz.	Weight of meat after cooking: 16 lbs. 10 oz.
Fat . . 2 „ 14 „	Fat . . 2 „ 0 „
Loss in cooking . . 8 lbs. 2 oz.	Loss in cooking . . 5 lbs. 2 oz.
Gas used . . . . 98 cub. ft.	Gas used . . . . 59 cub. ft.
Cooking space in oven: 23 in. by 18 in. by 20 in.	Cooking space in oven: 23 in. by 18 in. by 18 in.

In the foregoing it will be remarked that, with the externally heated cooker, for doing practically the same amount of work, the consumption of gas was only 59 cubic feet compared with 98 cubic feet with the ordinary form of oven. Now to a Company having a large number of depôts, and extensive demands at each depôt for cooked articles, and for six days in the week, such a saving in gas consumption on a single test represents a very considerable sum annually. To arrive at this sum, there would have to be multiplication again and again. The test does not give much room for scepticism; and if there were any doubt on the Company's part, they would not be taking the course they are doing in extensively adopting externally heated ovens.

The second point, as to the loss of weight of meat (a saving being shown by the externally heated oven), is an interesting one, particularly in view of the claims of the electric-cooker people. Supplementing the figures on this point in the foregoing table are others from subsequent tests; and these we are able to also reproduce:

Special Tests on Losses in Weight of Meat Cooked in Ordinary Oven and Potterton's "Sealed" (Externally Heated) Oven.

Ordinary Oven. *May 29, 1914.*	Lbs.	Oz.	Loss. Lbs.	Oz.
One piece ribs of beef	16	8		
After cooking. .	12	10	3	14
Fat	1	4		
June 3.				
Ribs of beef . .	21	5		
After cooking .	14	2	7	3
Fat	3	7		
Gas used, 95 c. ft.				
June 4.				
Two legs of mutton . . .	20	11		
After cooking. .	13	4	7	7
Fat	3	2		
Gas used, 95 c. ft.				

Potterton's Patent No. 3 "Sealed" Oven (Externally Heated).	Lbs.	Oz.	Loss. Lbs.	Oz.
Two pieces ribs of beef—				
One piece . .	17	8		
After cooking .	14	2	3	6
One piece . .	15	8		
After cooking .	12	12	2	12
Fat from both joints . . .	1	12		
Ribs of beef . .	21	5		
After cooking. .	14	9	6	11
Fat	3	6		
Gas used, 54 c. ft.				
Two legs of mutton . . .	20	12		
After cooking. .	14	7	6	5
Fat	2	14		
Gas used, 59 c. ft.				

Again smaller losses in weight are shown by these trials.

In such an enterprise as the Aerated Bread Company, the heating of water is a matter of considerable moment. It must be expeditiously and cheaply heated; and, though this has nothing to do with the question of the economic advantages of the use of externally heated gas-ovens, it has passing interest as showing, by a change of system, a considerable saving in cost.

Water Heating for Washing-Up Purposes.

By the "A. B. C." Steam Apparatus.	*Potterton's Water Heating System.*
Water . . . . . , 69° Fahr.	Water . . . . . 69° Fahr.
40 cubic feet of gas used.	40 cubic feet of gas used.
12½ gallons water drawn into sink, 125° in bulk.	12½ gallons water drawn into sink, 137° in bulk.
Hottest water at tap, 137° at commencement.	Hottest water at tap, 150° at commencement.
Temperature after drawing 12½ gallons, 124°.	Temperature after drawing 12½ gallons, 140°.
13 cubic feet of gas used while drawing water.	2 cubic feet of gas used while drawing water.
Total gas consumed, 53 cubic feet.	Total gas consumed, 42 cubic feet.
Five days' consumption, 6015 cubic feet.	Five days' consumption, 4252 cubic feet.

The next tables supply the results of temperature tests made on the three following constructions of oven:

TABLE I.—Ordinary gas-oven.

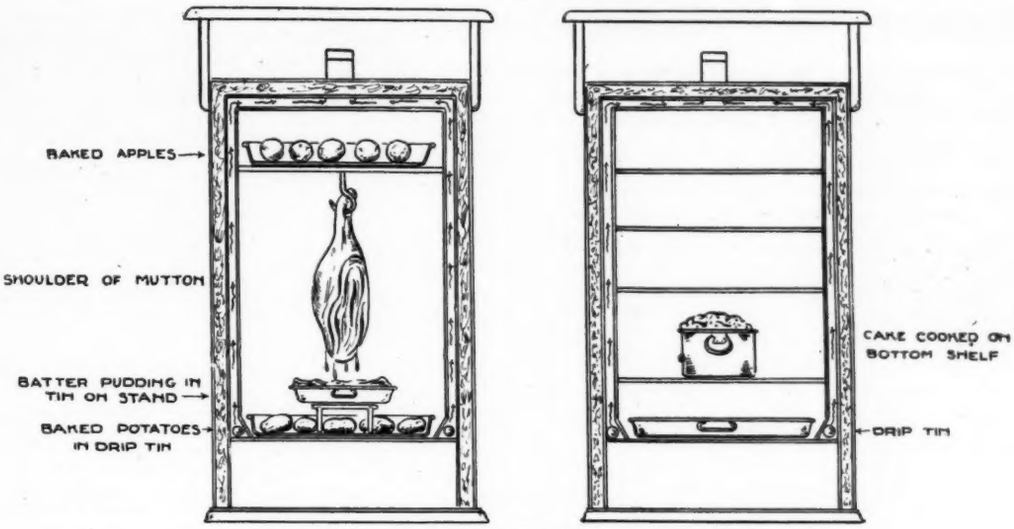
TABLE II.—Externally heated oven, with one gas-burner under bottom, and sheet-iron flue casing at sides and top.

TABLE III.—Externally heated Potterton "Sealed" oven, with two burners, one on each side at bottom, with cast-iron flue casing at sides and partly on top. The advantage with this type of oven is that the dripping-pan can stand right down on the bottom.

TABLE I.—*Test of Ordinary Gas-Oven.*

Time.	Gas Consumed. Cub. Ft.	Degrees Fahr. Top of Oven.	Degrees Fahr. Bottom Grid.	Remarks.
7.45 ..	— ..	— ..	—	Gas lighted.
8.0 ..	7 ..	475 ..	470	
8 30 ..	13 ..	380 ..	355	One thermometer on top grid and other on bottom grid.
9.0 ..	19 ..	390 ..	360	
9.30 ..	24½ ..	370 ..	345	
10.0 ..	29¾ ..	365 ..	340	
10.30 ..	35 ..	365 ..	340	
11.0 ..	40½ ..	360 ..	335	
11.30 ..	45¼ ..	358 ..	330	
11.45 ..	47½ ..	358 ..	330	Gas turned off.
TIME: Four hours.		GAS CONSUMPTION: 47½ cubic feet.		
12.45 ..	— ..	125 ..	110	One hour after turning-off gas.

COOKING SPACE IN OVEN: 14 in. by 13 in. by 19 in.



POTTERTON'S "SEALED" OVEN, HEATED EXTERNALLY.

TABLE II.—*Externally Heated Gas-Stove.*

(Not of the "Sealed" Type.)

Time.	Gas Consumed. Cub. Ft.	Degrees Fahr. Top of Oven.	Degrees Fahr. Bottom of Oven.	Pressure.	Remarks.
11.30	—	—	—	35/10	One thermometer on top grid, other on bottom grid.
12.0	12·9	370	420		Gas reduced.
12.30	19·2	380	410		
1.0	23·9	340	380		
1.30	29·5	320	350		
2.0	35·6	340	370		
2.30	40	350	390		
3.0	45·9	350	390		
3.30	50	350	390		Gas turned off.
TIME: Four hours.		GAS CONSUMPTION: 50 cubic feet.			
4 30	—	190	190		One hour after turning off gas.

INSIDE DIMENSIONS OF OVEN: 17 in. by 14 in. by 13 in.

TABLE III.—*Test of No. 1 Externally Heated "Sealed" Oven.*

Time.	Gas Consumed. Cub. Ft.	Degrees Fahr. Top of Oven.	Degrees Fahr. Drip-Tin.	Remarks.
10.30	—	—	—	Gas lighted.
11.0	13	405	455	One thermometer on top grid shelf, the other in drip-tin.
11.5	15	440	500	Gas reduced.
11.30	17½	442	415	
12.0	20	400	355	
12.30	22¾	370	328	
1.0	25¾	360	325	
1.30	28¾	365	330	
2.0	31¾	355	320	
2.30	34¾	350	320	Gas turned off.
TIME: Four hours.	GAS CONSUMPTION: 34¾ cubic feet.			
3.30	—	230	190	One hour after turning-off gas.

INSIDE DIMENSIONS OF OVEN: 14¾ in. by 13 in. by 20 in.

The two tables which it is useful to compare are the first and the third—being tests respectively with an ordinary cooker and an externally heated "Sealed" oven. The rise in temperatures will be noted; and for attaining and maintaining approximately even temperatures, it will be observed that 47½ cubic feet of gas were consumed in the ordinary oven, as against 34¾ cubic feet in the "Sealed" oven—a saving of 12¾ cubic feet for a single run. Another point to remark is that an hour after turning-off the gas the temperature at the top of the ordinary oven was 125° Fahr., and at the top of the "Sealed" oven 230° Fahr.; while at the bottom grid with the former, it was 110° Fahr., and at the drip-tin of the latter 190°. This residual heat is of value, and can be put to good use in the cooking operations. The change from sheet-iron to cast-iron flue casings in the case of the "Sealed" oven necessitates rather more time to heat-up; but the heat is retained longer after the gas is turned-off. This is proof that there is less loss of heat by radiation throughout the time of use—hence one reason for the smaller consumption of gas; the other reason being that the heat generated by the combustion of the gas is put to more effective use, through the oven being encased by it. In making these temperature tests, Mr. Potterton's view is that the proper method of ascertaining the relative costs of cooking in an oven is to find the cost of maintaining a cooking temperature for three or four hours.

Further as to the oven temperature in Tables I., II., and III., it should be observed that in each case it was raised to 400° Fahr. and upwards, and then set to burn sufficient gas to keep the oven up to 350° Fahr.—a low cooking temperature; the ordinary oven No. 1 and the externally heated oven No. 2 each consuming 10 cubic feet of gas per hour. The advantage was with the externally heated oven. With the Potterton "Sealed" oven, only 5 cubic feet per hour were consumed. A series of tests shows that, after heating up a "Sealed" oven, the consumption of 8 cubic feet of gas will do the same work as 14 cubic feet in an ordinary oven. The results of these tests are as follows:

Ordinary Cooker.

Gas lighted 5.45.

Gas Consumption.	Oven Temps. Top.	Bottom.
4 cub. ft.	400°	265°
8 ,, ,,	440°	340°
12 ,, ,,	460°	340°

Gas reduced to 14½ cub. ft. per hour.

One hour later at 14½ cub. ft. per hour.

Total gas:

26½ cub. ft.	450°	350°

Cooking space: 19 in. by 14½ in. by 12 in.

Externally Heated "Sealed" Cooker.

Gas lighted 5 55.

Gas Consumption.	Oven Temps. Top.	Bottom.
4 cub. ft.	168°	150°
8 ,, ,,	300°	320°
12 ,, ,,	410°	444°

Gas reduced to 8½ cub. ft. per hour.

One hour later at 8½ cub. ft. per hour.

Total gas:

20½ cub. ft.	440°	410°

Cooking space: 20 in. by 13¾ in. by 13 in.

We may conclude this presentment of interesting data concerning the temperatures and gas consumptions of ordinary and externally heated ovens by giving the results of an actual test made, by a lady cook of one of the London gas companies, at a private house at Wandsworth Common.

Test of Potterton's Patent No. 3 "Sealed" Oven Cooker.

Gas lighted	10.0 a.m.
Four pastries put into oven, under browning-shelf	10.30
Four pastries taken out	10.40
Two pastries put in—one on first shelf, one in drip-tin	10 40
Two pastries taken out	10.50
Four pastries put in	10.50
Four pastries taken out (browning-shelf out).	10.58
Apple tart put in	11.0
Pastry brown (gas turned half-down)	11.15
Gas out	11.17
Pastry taken out (too brown)	11.25
Meat put in, and gas re-lighted [Turned half-down.]	11.30
Meat hung from grid shelf.	
Potatoes put in drip-tin.	
On top shelf, milk pudding and jam tart.	
Batter put in, and gas turned on a little	12.15 p.m.
Tart taken out.	
Meat, potatoes, and batter taken out	1.0

Shoulder of mutton (5 lbs. 7 oz.), batter pudding, and potatoes, and rice pudding, well cooked.

Mr. John Webster, M.Inst.C.E., the Bradford Deputy Water Engineer, and his wife celebrated their Golden Wedding anniversary on the 5th inst.; and, as it happened, the event almost synchronized with the completion of fifty years' service in the department. Mr. Webster (who is 73 years of age) justly claims that he has grown up with the Bradford water undertaking. He has served the department under three Chief Engineers—Mr. Charles Gott, Sir Alexander Binnie, and Mr. James Watson, the present Engineer.

WATER BILLS FOR THE COMING SESSION.

AMONG the projects that will engage the attention of Parliament during the ensuing session—beyond the Gas Bills, &c., that have already been dealt with in our columns, *ante*, pp. 15, 75, 133—are the following

WATER BILLS.

The Corporation of Burnley are asking for an extension of time for the construction of certain water-works authorized by their Act of 1908. Included in this authorization was the Hurstwood reservoir, with the construction of which considerable progress has been made. But it may not be possible to complete it within the time limited by the Act, which expires on Aug. 1, 1918. Hence the application for an extension of time. Owing to unforeseen engineering difficulties, the estimate of expense for the construction of the reservoir and other works connected therewith has been found to be insufficient; and the money which the Corporation were empowered to raise for the purchase of lands and wayleaves, and for the construction of the water-works, has been exhausted. So they desire power to raise further money. The extension of time sought is five years from Aug. 1, 1918; and the additional borrowing powers for the construction and completion of the Hurstwood and other works are £160,000, repayable in sixty years. New proposals are made as to rents for the supply of water for domestic purposes. It is intended that the rent shall be a sum not exceeding 8 per cent. per annum on the gross estimated rental of the premises—provided that the Corporation at the commencement of every financial year or half year, as they may determine, shall make an estimate of the probable revenue and expenditure which will be received and incurred during the year or half year as the case may be; and if such estimate, without taking into account any sum paid to the reserve fund, shows that there will be a deficiency in the net revenue of the water undertaking for the year or half year as the case may be, the Corporation may charge a rent not exceeding 10 per cent. on such gross estimated rental; provided further that the Corporation shall not in any case be compelled to charge for water supplied for domestic purposes to any premises or part of any premises any less rent than 2d. per week. The Treasury limitation as to raising money is included in the Bill. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

Additional water-works are required by Tynemouth; and the necessary powers are being sought. The Corporation have water-works on, and obtain a supply of water from, the River Font and the Fallowlees Burn; the water being supplied within the borough and the urban district of Whitley and Monkseaton, and to certain local authorities, companies, and persons outside these limits. The Ashington District Council were in Parliament last session seeking powers to obtain water from sources which the Tynemouth Corporation contended should be reserved for the augmentation of their supplies, and some of which sources were actually situate upon lands already acquired by the Corporation. A Committee of the House of Commons found that an adequate supply of water was urgently needed in the Ashington district; but they thought that economy in expenditure, and the utilization to the best advantage of the available water resources of the neighbourhood, would result from Tynemouth promoting a Bill to supply water throughout the Ashington district, and to purchase the mains, pipes, and meters in the district. Complying with this furnishes one of the principal features of the Bill now in Parliament. The clauses provide for the supply of the Ashington district from the Hebron service reservoir (which will have a capacity of 1,100,000 gallons), as soon as its construction is completed. Then provision is made for the sale to the Corporation of the mains, pipes, and meters of the District Council. Agreements with the Duke of Portland and the Ashington Coal Company, Limited, are to be cancelled; and, until Dec. 29, 1931, the Corporation are to be entitled to the exclusive use of certain plant and apparatus of the Coal Company at an annual rent of £150. But power of subsequent purchase is given. The works to be authorized are: No. 1, a line of pipes terminating in the Hebron service reservoir; No. 2, the service reservoir; No. 3, a line of pipes from the reservoir to Ashington; and Nos. 5 to 10, are aqueducts, conduits, or lines of pipes. Powers to purchase lands and to take waters are included. If the Corporation within a period of three years, or such other period as the Local Government Board may allow, are not furnishing, or are not prepared to furnish on demand, a sufficient supply of water, the powers to supply within the district are thereupon to cease and determine. Periods are named within which the various works have to be completed. There are provisions for the benefit of the fisheries in Coquet fishery district. The North British Railway, the Duke of Portland, the Hon. Hugh Edward Joicey, the Duke of Northumberland, Isabella Francis Thorp and others, and the Rothbury Water Company have protecting clauses. Should the Morpeth Rural District Council require for the supply of East Chevington a supply of water in bulk, not exceeding a maximum of 40,000 gallons per day, it is to be supplied at the price of 6d. per 1000 gallons—the water to be taken from the new Hebron service reservoir. The complete financial requirements are: For the purchase of lands and easements for the construction of works Nos. 1, 2, and 3, £27,860, with a repayment period of sixty years from the date or dates of borrowing. For the purchase of the water mains and meters belonging to the Council, the sum requisite, with a repayment period of thirty years. For any capital or compounded sum or sums of money payable by the Corporation in connection with the repeal of the agreements of the Ashington Coal Company, and uses of their plant and apparatus, the sum requisite, repayable within such period as the Local Government Board may sanction. For expenditure already incurred in connection with lands, £3200, with a repayment period of sixty years. For the purchase of further lands and easements for the construction of works Nos. 5 to 10, £49,400, with repayment in sixty years. For provision of benefit for the fisheries in the Coquet fishery district, the sum requisite, with repayment in sixty years. For the enlargement of works No. 2, £7600, with sixty years repayment. For new mains, extensions of mains, service-pipes, &c., £10,000, with a repayment period of thirty years. Further borrowings will be with the sanction of the Local Government Board. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

The Wakefield City Council are desirous of not proceeding with the construction of the impounding Oxygrains, Booth Dean, and Linsgreave reservoirs as authorized by the Corporation 1889 Act, and to construct on the sites of the first two named other reservoirs. It is submitted that it is expedient that the time for the construction of the Lee Hill reservoir and the line of pipes authorized by the Act of 1889 should be further extended. By the Acts of 1889 and 1909, the Corporation were authorized to borrow money for the purposes of the works authorized by the Act of 1889; but £9868, sanctioned by the Act of 1889 has not been borrowed, nor has any of the money (amounting to £150,000) authorized by the Act of 1909. In consequence of the abandonment of the Oxygrains, Booth Dean, and the Linsgreave reservoirs, and their substitution by other works, it is submitted that it is expedient that the Corporation should be empowered to apply to the purposes of the present measure the sum of £5000, part of the £9868 authorized by the Act of 1889 and the £150,000 authorized by the Act of 1909. The estimate for the purchase of lands and the construction of works is £155,000. The new works proposed are an enlargement and extension of the Green Withens reservoir, to be formed by lengthening the existing embankment and raising it throughout to a height of 2 ft. 6 in. above the top of the present embankment; a line of pipes or conduit commencing in the Linsgreave Catchwater; an impounding reservoir to be called the New Oxygrains reservoir, to be formed by means of an embankment 6¼ chains or thereabouts in length; a line of pipes or conduit, to be called the Oxygrains conduit; an impounding reservoir to be known as the Upper Booth Dean reservoir; an impounding reservoir to be called the Lower Booth Dean reservoir; and a gauge basin. There are some clauses referring to the accommodation of workmen during the construction of the reservoirs, to the power to take water, and to the provision of compensation in water. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

By their Act of 1889, the Yeadon Water-Works Company were empowered to divert, impound, and use the waters of the Black Beck and the Middle Beck, and all other springs, streams, and waters which would or might be intercepted by works shown on plans then deposited, or which might be found in, on, or under any of the lands for the time being belonging to the Company; but they were prohibited from taking the water flowing from any land eastward of the eastern boundary of Hawksworth Moor. The waters of the Black Beck and Middle Beck constitute the main supply for the Company's statutory limits; and it is of great importance to the Company and their consumers that the waters of the drainage area of the becks above the Company's aqueducts should not be diverted from such drainage area, or be prejudicially affected. With the view to prevent this, and to secure and preserve the quantity and purity of the waters that the Company were, by their Act of 1889, authorized to divert, impound, and use, they have entered into an agreement for the purchase of certain lands and water rights, while preserving the use of the land for sporting purposes. It is declared expedient and urgent that the agreement be confirmed, and that the Company be empowered to carry the same into effect. They also require sanction to the construction of additional works, and to the acquisition of further lands, easements, and rights, and to have repealed the prohibition as to water flowing from any land situate eastward of the boundary before mentioned. They also seek power to supply Hawksworth (through which their mains pass), and to be relieved of an obligation to supply water to Baildon if so required by the local authority—the obligation having been in existence since 1889, but the Company have never been called upon for a supply. The capital the Company are authorized to issue, under their Acts of 1870 and 1889, totals to £49,991; but they have raised £50,288, including £2296 of premiums. The loan capital authorized amounts to £12,500; and £9260 has been raised. The whole of the money has been properly applied to capital purposes, as well as a further sum of £3300. The Company now ask that the stock raised under the Act of 1889 which has produced (with premiums) an amount exceeding the £28,000 authorized, be confirmed, and that they be empowered to raise additional capital. Turning to the clauses, the works the Company desire authority to carry out are, in the parish of Hawksworth, an enlargement of the Reva reservoir, the construction of three catchwaters, a well, pumping-station, and a rising-main; and, in the urban district of Rawdon, a service-tank and two conduits. Ten years are proposed as the period within which the works are to be completed. The proposed powers in regard to the taking of water and the

acquisition of land are defined; and it is suggested that the compensation water provided for by the Act of 1889 shall be accepted by all persons interested as full compensation for any waters taken under the powers of the present measure. It is contemplated that the limits of supply may be extended so as to include the urban district of Guiseley and the parish of Hawksworth. Power is also desired to purchase the undertaking of the Guiseley Water-Works Company, or part of it. If after the expiration of seven years, the Company are not supplying or not sufficiently supplying Hawksworth, the Rural District Council of Wharfedale may provide a supply; and similar powers (applicable at any time after the acquisition of the property of the Guiseley Company) are to be conferred upon the Guiseley District Council. The additional capital sought is £10,000; such part as is issued as ordinary being entitled to a dividend of 7 per cent., and such part as is issued as preference to 6 per cent. The borrowing powers proposed, under the Acts of 1870 and 1889 (including the £9260 already borrowed), amount to £16,760; and up to one-third part on the additional capital. Power to issue redeemable debenture or preference stock is sought, with the formation of a redemption fund. A number of miscellaneous clauses are inserted in the Bill. [*Parliamentary Agents: Messrs. Rees and Freres.*]

PERFUMES FROM TAR OILS.

In continuation of his series of notes on the highly-refined organic substances in commercial demand for which oils from gas tar supply the raw material [see "JOURNAL," Vol. CXXXII., pp. 597, 707] Professor A. Mailhe, of Toulouse, deals, in a recent issue of the "Journal des Usines à Gaz," with those employed in perfumery. Here, as he points out, progress in replacing natural products by those of the chemical factory has not been so rapid as in the far greater field of colouring matters. Nevertheless, his prediction is that synthetic methods will revolutionize the perfumes industry as it has already done that of dyes. Much has already been accomplished. One notable instance is vanillin, one of the most widely-used perfumes and prepared, in many factories, identical in composition with that extracted from vanilla pods. The manufacture of vanillin is covered by over seventy patents; while the price per kilo has fallen from 8750 frs. in 1876 to 50 frs. in 1913.

Other perfumes, which likewise are the subject of industrial manufacture, are heliotropine, essence of bitter almonds, and artificial aubepine, all of which are bodies identical in chemical composition with the same perfumes obtained from plants. In a different category, however, is artificial essence of violet—a synthetic perfume which chemically has nothing in common with the essence extracted from violets. This body opens up new fields in synthetic chemistry—viz., the creation of artificial perfumes similar in odour to those of certain plants, but not identical with the latter in chemical composition. On these lines much work has been done and important results obtained, often by chance. The most notable of these is artificial musk, which chemically is in no way analogous to the principal odoriferant in natural musk. The latter has been almost completely supplanted by the former, which at the present time is the basis of most commercial perfumes. Another important series of artificial perfumes is the geraniums, made at prices from 8 to 10 frs. per kilo.

As raw material for the manufacture of perfumes, light tar oils are of importance from their content of benzene, which is readily converted into nitro-benzene, yielding essence of mirbane with its odour of bitter almonds. Toluene is likewise readily convertible into benzoic aldehyde or essence of bitter almonds, identical with the natural product present in peach kernels, cherries, and leaves of the cherry laurel. It is further converted into cinnamic aldehyde, the chief constituent of Chinese or Ceylon essence of cinnamon. It has the strong odour of cinnamon, and by reduction yields cinnamic alcohol or artificial hyacinth.

The cumenes and xylenes in light oils also form the raw stuff of the perfume maker. Paracumene is identical with that in essence of thyme; while metaxylene is converted into artificial musk. Toluene yields a valuable artificial perfume allied to musk.

From the medium oils, phenol is the material used in making artificial geranium (phenyl oxide) by a direct catalytic process. The three cresols, by the same process, yield cresol oxides, also of the geranium odour. By employing mixtures of phenols and cresols, various artificial geraniums are producible, though hitherto only with great difficulty. The process is one which makers have attempted to place on a factory basis.

Also *B*-naphthol, with methyl or ethyl alcohol, yields, by a catalytic process, the perfumes yara-yara and neroline respectively, which form the base of eau-de-cologne.

Again, salicylic aldehyde, from phenol by the action of chloroform and potash, forms an important perfume, while methyl salicylate is essence of winter green, and salicylic aldehyde, by action of acetic anhydride, gives rise to coumarine, remarkable for its soft perfume.

These various examples, M. Mailhe concludes, demonstrate the importance of coal distillates for manufacturing perfumes. The less rapid progress in the synthetic production of perfumes arises from the difficulty of isolating and identifying the many different bodies in essences. With further knowledge of these constituents, great progress will undoubtedly be made in the factory production of perfumes.

YORKSHIRE JUNIOR GAS ASSOCIATION.

The members of the Yorkshire Junior Gas Association met last Saturday afternoon, in the beautifully equipped show-rooms, in Darley Street, of the Bradford Corporation Gas Department. Mr. J. B. BALMFORTH (the Senior Vice-President) presided, and the recently-elected President (Mr. John Demaine, of the Garforth Gas Company) delivered his Presidential Address.

The CHAIRMAN said he was sorry to notice the attendance was rather smaller than usual; but it was easy to understand this in such a time as the present. He might mention that Mr. Charles Roper, of the Bradford gas undertaking, had brought an invitation from Mr. E. Gillett, the Manager of the Thornton Road Gas-Works, to the members to visit the works after the meeting, and view a gasholder which is in course of dismantling.

Mr. JOHN DEMAINE then gave the following

PRESIDENTIAL ADDRESS.

Unlike many Past-Presidents of this Association and others, it is my first appearance in any presidential capacity; and this, combined with the fact that my sphere of action is confined to the dual capacity of manager and secretary of a comparatively small undertaking, may make any remarks of mine seem commonplace when compared with the highly technical addresses which have from time to time been given.

I wish to confine my remarks to-day to two topics:

Small undertakings and the possibilities that may be attached to them.

The position of small undertakings in respect to the greatly regretted troublesome times, and the uncertain future as affecting the working and financial standpoints.

POSSIBILITIES OF SMALL UNDERTAKINGS.

The possibilities of small undertakings are many and wide in the matter of the attainment of that greatly desired end—increased sales, and (following in due course) increased returns. By increased returns I do not mean being content with the same profit per 1000 cubic feet of gas made, or sold, or per ton of coal carbonized, but an increased ratio; for if this is not aimed at, it could well be argued, Why spend money in developing your undertaking and increasing your indebtedness and responsibilities for no increased pecuniary returns?

One of the first aims of anyone in charge of a gas undertaking is to give the best possible satisfaction to the consumers generally, and to keep in the good graces of the local authority; for if these objects are attained, or even partially so, many rough places can be made smooth, as pleasant business and working relations constitute in themselves a handsome asset. This applies particularly to small companies; and only those in charge of small works can understand how unpleasant things can otherwise be made.

Another great aim is to reduce the standing charges as much as possible; for therein lies one of the greatest assets of any gas undertaking. This can only be attained by an increased output commensurate with judicial capital expenditure. It is, of course, agreed that we must see some certain return for any expenditure before we can recommend our Boards or Committees to commit themselves to it. Any capital expended otherwise lies dead, and weighs most heavily—far more so than in very large undertakings, and therein, perhaps, lies the reason why so many small undertakings do not launch out into new ventures, which, if well carried out, would certainly result in highly beneficial returns—it being always kept in mind that every additional 1000 cubic feet of gas sold should yield an increased ratio of profit by automatically reducing the manufacturing charges, and so eventually the selling price.

HIGH-PRESSURE DISTRIBUTION AND SLOT METERS.

In these days of high-pressure distribution, extensions into outlying districts, which would never have been seriously thought of have become possible, and can be carried out at a capital expenditure which would not have been thought feasible only a few years ago. In such districts lie many fruitful fields, which are only waiting to be developed, and which turn out capital investments; for, be it remembered, "Once there, always there."

In our own particular district—a mixed one, comprising a residential and mining population—we were at a standstill, more or less, up to a few years ago, when it was decided to try slot installations on a limited scale. This was commenced in the latter part of 1906; and a marked improvement in the output immediately resulted. The policy was continued, and the output was steadily increased, as the following particulars show:

Year.	Number of Consumers.	Sale of Gas.
1905	233	4,529,000 cubic feet
1906	400	4,782,000 ,,
1909	654	6,627,000 ,,
1912	803	9,765,000 ,,
1915	1300	15,000,000 ,,

The earlier increases were practically wholly due to the introduction of slot installations; while, as will be seen later, the latter increases resulted from additional consumers secured through extensions to outlying districts.

In the early part of the above period, and very possibly as a

result of the go-ahead policy being adopted, public lighting was established; so that now we have a total of 153 lamps, which, as the number has steadily grown, has proved a valuable asset.

GRADUAL EXTENSIONS OF PLANT.

Of course, it will be perfectly understood that these greatly increased sales demanded a large increase, or seemingly large increase, in the capital outlay to provide for extensions of works, new mains, &c. Unfortunately, the original design of the works did not allow much for any possible increase in the output; and up to a certain point only the existing works, with minor alterations, kept pace with the extra demand. The time came, however, when something had to be done. The site being a valuable one, a removal of the works was not to be entertained; so it was decided to extend in a gradual manner, which was done in something of the following order.

An exhauster was installed, with a gas-engine, boiler, and steam-engine (as a stand-by), new workshop and store, new purifiers, new station meter and governor, new gasholder in a steel tank, compressor, retort-house extended, and direct-fired setting replaced by regenerators. Saving the site, therefore, we have very little left of the works and apparatus which were in use seven or eight years ago; but in its place we have plant for dealing with (by very little additional expense) a make of 25 to 30 millions.

Eight years ago, there was no exhauster in use, and, indeed, very good results were being obtained without one—results perhaps as good as are being obtained in some small works to-day with an exhauster in use. Again, up to two years ago, we had only direct-fired settings at work, and very good results we got from them, too, as we regularly sold 7½ to 8 cwt. of coke per ton of coal carbonized, and made 11,000 to 11,200 cubic feet of gas per ton. This condition of things caused the Directors to be very loth to make any change in the matter of retort-settings, which was perhaps natural. However, the change was eventually made; and we are now reaping immense benefit from it, by an increased sale of at least 2½ cwt. of coke per ton of coal—and an extra 2½ cwt. on a matter of 1400 tons of coal pays a very handsome return on the outlay incurred.

GAS OR STEAM FOR DRIVING.

Here, I might with advantage, I think, touch on the question of the "Drive" employed on small works—say, from 20 to 25 millions. On quite a number of works which I have visited in the course of travelling about the country on holidays, &c., I have noticed that a boiler and steam-engine are employed for the purposes of driving an exhauster, washer, pumps, &c.

On one works in particular—a works making about 11 millions—(quite remote from Yorkshire by the way), I noticed a large steam-engine of old-fashioned design, and of about 7 to 8 H.P. pounding away at about 3 H.P.; the engine itself being in a bad state of repair. The cost of driving must have been enormous.

What amazed me most, however, was that they were selling coke at £1 per ton; and I have often wondered if the management had ever thought of what saving could be effected by installing a gas-engine. At a rough estimate I should say about £70 per annum easily. In my opinion, a gas-engine drive is ideal for gas-works plant, and should be installed wherever practicable, as the saving in coke, labour, and wear and tear is not to be despised in these times, or indeed at any time.

THE DISTRIBUTION SYSTEM.

Turning now for a short time to the necessary extensions in our distribution system. In 1909 we had just 4 miles of mains—the largest being 6-inch. We have now 15¼ miles, varying in size to 8 inches, included in which figure is 5 miles of 4-inch high-pressure steel main. It will be seen therefore that no small amount of the capital expended (as per the particulars to follow) has been absorbed in the district mains. Excepting the high-pressure main, practically the whole of the mains are of cast-iron.

A few particulars of the high-pressure main may be of interest. We used 4-inch rigid jointed mains of 8/9 gauge, and lead wool for the joints. To the first outlying district, we had Mannesmann tubes, and employed a main jointer from the Lead Wool Company. To the second district we laid Stewarts and Lloyds tubes, of similar size and gauge, doing the jointing ourselves. In regard to the tubes themselves, we had an analysis made of samples, which showed that in strength and quality there was nothing to choose between them—they were excellent pipes throughout, well wrapped and re-coated. A test of 28 lbs. per square inch was made on the first section, and all proved tight. On the second section we made no test (scarcely being in a position to do so); but I was perfectly satisfied that all was tight, and the fact that our leakage per mile of main continues to decrease proves that we had nothing to fear. The trench digging was done by contract, at a price per running yard.

I might here remark that the first out-district mentioned was the village of Aberford, which possessed its own gas-works and one mile of main—the undertaking, with the exception of the site and apparatus, being purchased from the existing Company. The second district was the village of Barwick-in-Elmet, where there was no gas lighting up to the time of our going there. The majority of houses have slot installations; our own men doing the whole of the fitting-up, on piece work—the Company finding all materials.

We compress at the works to ½ lb. pressure per square inch; and at the entrance of each village we have an underground brick chamber, containing duplicate sets of governors, which reduce the pressure down to 3½ inches. These governors are of the diaphragm type, and are capable of dealing with all pressures up to 5 lbs. The compressor is of the rotary type, and capable of passing 5000 cubic feet per hour up to 5 lbs. pressure.

CAPITAL EXPENDITURE.

Below is given the capital expended per million cubic feet sold over the period 1906 to 1915.

Year.	Capital.	Gas Sold. Cubic Feet.	Expended per Million Feet Sold.
1906	£6,588	4,782,000	£1370
1907	7,000	5,662,000	1236
1911	9,000	9,402,000	957
1915	14,467	15,100,000	958
Increase in capital expended			106 per cent.
Increase in gas sold			166 ,,

It will thus be seen that there is a marked fall in the capital expended per million; and this in spite of the fact that we have had to provide pipes and fittings for something like 700 consumers, while at the best of times it is an expensive matter remodelling old works. Moreover, we have works which have now practically new plant throughout, the capacity of which can be largely increased from present requirements, at very little cost—a works which is of infinitely more value and of better earning capacity than some years ago.

THE WAR AND THE INDUSTRY.

Treating now with the second part of my subject—the effect of the times on the position of small undertakings. The war has made its effect on the whole of the industry of the country in different ways. Gas-works have answered the call for men to a remarkable degree, and have given of their best; and, on looking round, it is remarkable how work is being carried on at the usual high standard, in spite of the number of men who have been lost to them. It is now pretty well known to the country in general the great part which gas-works are taking in supplying raw materials for the production of high explosives, and the many uses to which gas is being put in munition factories and others. Its uses are almost legion; and the public generally, would be greatly surprised if they knew one-half of the many purposes in which its use has been found of value. No doubts exist in my own mind that when the war does come to a close, gas will have found a permanent home in many places for numerous purposes for which it has not hitherto been used; and therefore all means in our power should be exerted to make the best of these opportunities.

LABOUR SCARCITY.

The past year, as you are aware, has been notable for many things as affecting gas-works, among which are the great difficulty that has been experienced in obtaining suitable labour to carry on work, in obtaining anything like full quantities of coal and other materials, and in getting rid of bye-products, owing to railway congestion and other causes beyond our control.

Our friends in large works have undoubtedly felt the pinch of labour. It must, however, be remembered that they have generally abundant machinery; and if they are short of a man or two, they might not be seriously inconvenienced. But on small works, where possibly only one or two men are kept per shift, if they fail, matters are at once serious. No doubt some of us could tell of having to tackle work in many directions which previously we should not have thought of touching. However, "necessity knows no law;" and when the tale comes to be told, it will prove highly interesting.

In regard to labour, in my own case we have seven coal mines within a radius of three miles, all shorthanded; and owing to the high prices they are receiving for coal, they are in a position to pay (and do pay) such wages to any man they can get as appears fabulous—8s. to 10s. per eight hours day and free, or exceedingly cheap, coal found. Then, in addition, we have a huge shell-filling factory in course of construction not more than a mile away, where labourers are being paid 8d. to 8½d. per hour—men earning over £3 per week for labouring. How are works like ours to carry on in face of things like these?—simply the best way we can.

I am, along with others, looking forward to the time when some thoughtful person will bring along a simple charging and discharging machine, or some system of modified vertical retorts, perhaps, which can be installed in small works. I believe such a system would be welcomed with open arms.

As to the financial aspect, this part of the subject I do not intend to dwell upon to any great extent. Consequent on the vast increase in the price of coal and other materials and labour, it is almost exceptional to find any gas-works which have been able to continue to sell gas at pre-war rates. Some have had to increase more than others—possibly on account of the great distance from the coalfields (more especially where the coal is sea-borne). But possibly, on closer examination, it may be found that other influences have had some effect on the amount of increase determined upon. Among such causes may be found—

(1) Capital account, which is not proportionate to the size of the undertaking.
(2) Where the responsible heads have not been sufficiently up to date in introducing improved methods of carbonization and working generally.

THE CAPITAL ACCOUNT AND UP-TO-DATE METHODS.

The first cause is rather a complicated question to tackle; but, whatever the reason, the effect is there, and it is undoubtedly a severe handicap on an undertaking at the present time, and when

competition is to be met its effects are very far-reaching. It behoves us, therefore, to watch very closely at all times any large expenditure being placed to capital account which might with every justification be placed against revenue charges, or if necessary to a suspense account, and written-off in so many years.

In reference to being up to date, this may be taken as effecting larger works more in particular. But it does still apply to smaller works, though perhaps in a lesser degree; for, if we cannot undertake to instal (say) stoking machinery and all its adjuncts, to reduce working costs, we might on looking round introduce other minor improvements, which may total up to a comparatively large sum. Take, for instance, the replacement of steam by a gas-engine, and the large saving effected thereby; the better washing of the gas for the extraction of ammonia, which in some places is not half done; also better attention paid to leakage, which is a matter sometimes lost sight of. Many other ways and means can be adopted, if they are only looked for and not waited for, by which saving can be effected, and thereby the stability of the concern greatly improved.

In conclusion, I should say that those who had already been alive to the introduction of up-to-date appliances must feel highly pleased in having carried out such schemes; for, undoubtedly, those who still have this expense to face will have to pay very dearly for it for some years to come.

The CHAIRMAN, inviting discussion, said the address had been a good one, and the subject had been particularly appropriate to the needs of a great proportion of members. He was one of the members who, like the President, were limited to small works, and it was of great value that they should relate their experiences as managers of small works. One point he would like to ask was with regard to the power for driving the exhausters, pumps, &c. The President said he thought a gas-engine was far cheaper and better than employing coke. He would like to know what he did with his coke breeze. In most works he had found coke breeze in use for this purpose, and he did not think there was anything cheaper than this, especially in winter time.

The HON. SECRETARY (Mr. Edward Garsed) said that Mr. Demaine opened by touching on the importance of entering into the good graces of the consumer and of the local authorities. He thought it was almost impossible in small undertakings to wholly attain this object; but there was no doubt that when it was done many rough places were smoothed over. A great deal depended not only on the manager of the works but on the staff, and their tact and discretion in carrying out their own part of the undertaking. It was much easier for managers to keep in the good graces of the authorities if the various heads of departments and others of the staff did their work with a mind always on the well-being of the concern. In regard to the outlay on standing costs, at his own place at Kippax they had had to contend with a lot of trouble arising from the cheap-Jack, door-to-door kind of gas-fittings in use by the consumers; and eventually they decided to attempt to combat this by opening a small shop and show-room of their own. This had proved a standing advertisement by the fact of having maintained a brilliant display and showing the valuable—particularly as compared with the cheap stuff to which the people had been accustomed—apparatus which the Company could supply. It certainly had done away with a lot of argument which was proved to be fictitious when looked into; and it had done a great deal to reduce the standing costs of the undertaking. Where complaints used to come in at the rate of 14 to 20 per day on the round of collecting slot meters, the figure was now something like the same on the whole round, owing to the wiping-out gradually of the cheap fittings. For twelve months prior to opening the shop, the cash sales for fittings had been about £10 to £15. In the first twelve months of its existence there was brought in from sales of fittings about £40; and this in spite of the fact that mantles and other fittings were sold in various kinds of shops in the town. In regard to the driving of gas-engines, his own works had been set out with a vertical three water-tube boiler, which was nothing more nor less than a coke eater. Apart from this, the steam-pump driving was direct, with the result that he was never certain during the night whether the liquor pump had been circulating. Six nights out of seven it did not run properly, and they lost ammonia. They had now a gas-engine; and, specially in view of the present price of coal, it had not far off paid for itself. With regard to coke breeze, his plan had been supposed to use coke breeze; but there was as much coke as coke breeze, and probably more, used in the boiler. Moreover, on many occasions he found that when the fire had been allowed to get low a very appreciable percentage of coal was being used. In regard to capital expenditure, the President had pointed out that a judicious outlay was about the only thing in small undertakings where originally there was a shortage of capital. It seemed a bit strange that, in order to make the most of capital outlay, more should be spent; but it was quite true that the only way to improve matters was to spend more. In the case of his own works, the capital per million cubic feet sold in June, 1911, was £1576. In three years this was reduced by £413 per million. The gas sales had increased by nearly 48 per cent., and the capital expenditure was reduced per million sold by more than 20 per cent. A point which Mr. Demaine had not referred to was the letting out on hire of gas stoves and fires. In the President's case, as in his own, it was difficult in a colliery district, where the mining population were given very cheap loads of coal per month, to think of pushing the use of gas fires and stoves. As to the difficulties of the time on small works, he did not think the war had had any great effect on his undertaking—indeed, they had a good deal more difficulty before the war than they had had since its outbreak. In the matter of housing, houses were so very scarce that they could not be got; and the result had been that his Company had difficulty in keeping stokers. They had had to build one or two houses to keep their men; and this was probably why they were not now troubled by the men going away to the coal mines to earn higher wages. They had, fortunately, built just when prices were beginning to rise—just before the war; and they had a return on the expenditure of about 6 per cent. Another matter which affected them all in small works, where they had no sidings or large coal-stores, was the question of carting coal to the works. They usually kept a moderate stock; but just now they were very much reduced. The question was as to whether they should not have their own team labour; and his undertaking would be glad of any information in regard to the cost of horse-keeping at present. He had intended to suggest, when speaking of housing, that it occurred to him that many larger undertakings might with advantage take this step in preference to co-partnership schemes.

The PRESIDENT said, in reference to Mr. Balmforth's query about power for driving, he quite agreed that steam was very useful on gas-works, particularly in winter. This was why, in his own case, they kept a boiler to look at in summer and to use in winter; but it was also why they had preferred to use a small amount of capital to employ all the year round by the use of a gas-engine. As to fuel used, he was inclined to agree with Mr. Garsed that coke was handier than coke breeze, and that coal, unfortunately, was handier still; and there was a great percentage used. He quite believed that, by the use of a gas-engine, a saving could be effected of about 2½ per cent. of coal carbonized. He agreed that their relations with local authorities were largely in the hands of the staff. One of the principal ideas, of course, in his address was in regard to the opening of roads. Some local authorities were very peculiar about this, and others gave the gas undertaking every chance to do pretty much what it liked. Speaking generally, however, if they did not restore the roads in proper repair, they made trouble quickly. In regard to gas fires and stoves, his undertaking was doing very well with them at present, despite the fact that they were in a colliery district. They did not let out on hire, but sold outright. The fires were an advertisement in themselves, and quite a lot had been sold through the impression people had got by seeing them in use in friends' houses.

VOTE OF THANKS.

Mr. CHARLES ROPER (Bradford), in moving a vote of thanks to the President for his address, said the question of small works was one which applied, perhaps, to not all the members of the Association; but there was no doubt that throughout the country the smaller works predominated. Any who were going to move away usually went to a small works, and it was as well that even those at present on large works should know something about the small ones. Mr. Demaine had mentioned a point as to the mechanical feeding for retorts. He was afraid the biggest stumbling block was the capital cost, because of the very great amount of time that any such plant would be standing idle. In regard to local authorities, in a large place like Bradford the gas undertaking did not experience much of the trouble which was so common in small places. It was, however, essential for anybody connected with the distributing side of a gas undertaking to leave as little as possible to chance, and that proper notice be given beforehand of the breaking-up of roads, though, of course, they could not give much notice in cases of sudden escapes. With regard to the filling-in of the roads, it was a serious point and one that was not thought as much about as it ought to be. In Bradford, the local authorities compelled all private contractors who broke a road to sign an agreement to make it good. They could imagine what it would be if all gas undertakings had to go through this every time; and this was why they should continue to give road authorities as little trouble as possible. With regard to team labour, he believed one of the largest Lancashire works the Association had visited some time ago had run their own team labour department. Team labour for the gas undertaking was a sorry trouble, and must receive very serious consideration indeed.

Mr. J. M'LUSKY (Halifax) seconded the vote, and it was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. GARSED, a hearty vote of thanks was accorded Mr. Charles Wood, the Gas Engineer to the Bradford Corporation, for the granting of the use of the show-rooms for the meeting.

VISIT TO THE THORNTON ROAD GAS-WORKS.

The party then adjourned to the Thornton Road Gas-Works, where, under the guidance of Mr. Gillett, the Manager, and one or two Bradford members, they viewed the gasholder which is being dismantled, and also had an informal look at the vertical retorts. The holder was the first one at the works, which were opened in 1846. It has been out of use for some years past, and its dismantling enabled the visitors to note several unusual features. Particular interest was evinced in the wooden struts from the bottom of the sides to the cover, the framing of which, also, was largely of wood. There were iron struts radiating along the bottom of the holder from an unusual wire and wood centre support. The holder had a capacity of about 80,000 cubic feet.

THE UTILIZATION OF ENERGY FROM COAL.

By Professor WILLIAM A. BONE, D.Sc., Ph.D., F.R.S.

At the Royal Institution of Great Britain last Thursday, Dr. WILLIAM A. BONE, F.R.S., Professor of Chemical Technology at the Imperial College of Science and Technology, delivered the first of a series of three lectures dealing with the above subject. The second lecture will be delivered on Thursday next, and the final one on Feb. 3.

FUEL ECONOMY.

The question of fuel economy and the proper utilization of coal is at the present juncture, as I pointed out in my Presidential Address to the Chemical Section of the British Association in Manchester, of the greatest national importance, not only in regard to the actual prosecution of the war, but also, and even more so, in view of the trying years of economic recuperation and re-adjustment that will follow hard upon its termination, because, of all directions in which national economy can be most healthfully and advantageously exercised, this is perhaps the most obvious and prolific. It is tolerably certain that, with an efficient and systematic public supervision and control of fuel consumptions, we ought to be able, even with existing appliances, to save many millions of pounds of our annual coal bill, and, with improved method and organization, still more millions—a saving which would, in the long run, redeem a considerable amount of the War Loan, which has been much more easily raised than it will be repaid.

The British Association have recently taken up the matter by appointing a strong Committee of representative chemists, engineers, technologists, and public men to consider the whole question from a national standpoint, and to report, through the Association, to the public, and, if need be, also to the Government, upon the chief direction in which large economies can be effected, and the best means by which the community can ensure their realization. Not only does it appear to me that the community ought to be informed from time to time upon such matters by its scientific leaders, but also that it has the right to insist on the proper and most economical utilization of its coal supplies, both in its own present interests and those of future generations, and that, if need be, the Government should be called upon to take such action as will check the most flagrant cases of wastefulness and abuse.

I am aware that such a suggestion will perhaps be objected to in some quarters on the ground that the operation of progressively higher prices of fuel will, in itself, be the surest and most potent compelling force in the direction of fuel economy in manufacturing operations. Undoubtedly there is something to be said for such a view; for, in the long run, it is the cumulative effect of the daily cost-sheet which impels the commercial mind to seek further economies. Also, it must be admitted that some of the foremost manufacturing concerns have already achieved great results in economy of fuel, and may be held up as shining examples of what can be done by the rigid and systematic application of scientific principles to the heat balance-sheet of a large industrial establishment. I am convinced, however, that the problem will never be solved from a national standpoint by the policy of leaving it to the slow operation of isolated and independent investigations. What is needed is a patriotic exchange and pooling of experience—a willingness to co-operate whole-heartedly and effectively, under skilled guidance and advice, for a national benefit; and this cannot be achieved except on the basis of some national organization.

VALUE OF COAL OTHER THAN AS FUEL.

Not only is coal of prime importance as a fuel, but, when suitably handled by the chemist, it yields very valuable bye-products. Thus from the tar and other condensable products of its distillation are obtained the raw materials for the manufacture of synthetic dyes—an industry which, although founded sixty years ago by the discoveries of British chemists, had, through our culpable neglect of chemistry, become so localized in Germany that at the outbreak of the war we were importing almost three-fourths of the £2,000,000 worth of coal-tar dyes required by our textile industries. This is a state of things as discreditable to our attitude as a nation towards the scientific aspects of industry as it is senseless from a business point of view, and which, it is to be hoped, will never be allowed to recur after the war is over. I do not wish it to be inferred from this sentence that I am advocating any sort of fiscal protection for the coal-tar dyes industry. On the contrary, I am convinced that any departure from our policy of free trade would imperil the interests of our great textile and engineering industries, not to speak of our heavy chemical and metallurgical (iron and steel) industries, and, above all, our shipbuilding and maritime supremacy, each and every one of which is of far greater magnitude and importance than any possible or likely development in the manufacture of dye-stuffs.

In addition to being the raw material for synthetic dyes, certain coal distillation products—toluene in particular—form the basis of the new high explosives which are being used in such large quantities, and with such appalling effects, in this great European War. For years before its outbreak, while German chemists had been diligently investigating the possibilities of T.N.T. as a high explosive, German technologists had already paved the way for its military use by ensuring a maximum supply of raw materials from German coal by the substitution throughout Germany of modern bye-product recovery coking plants for the old wasteful beehive ovens, whereas we were still, at the outbreak of the war, carbonizing about 6½ million tons of coal per annum in the beehive ovens—a state of affairs which is deplorable from every point of view, showing as it does how negligent and short-sighted we are of national interests in exploiting the most important of all our raw materials.

Another notable bye-product obtainable from coal is ammonia, in the form usually of sulphate, which is chiefly valuable in agriculture as a fertilizer. Indeed, the world depends upon the nitrogen in coal for about 90 per cent. of its ammonium compounds. Thus, in 1912, of the total British production of 379,000 tons of ammonium salts, no less than 318,000 tons were derived from coal. Here, again, we compare unfavourably with Germany, who in the same year produced nearly 500,000 tons of ammonium salts from a smaller total output of coal. Seeing that the profit on the production of ammonium sulphate was then certainly not less than £10 per ton, the profits accruing to the German people in that year from ammonium sulphate derived from coal probably exceeded ours by something like £2,000,000.

ORIGIN OF COAL.

To understand the nature and composition of coal, as well as the different classes and varieties of it met with in our coalfields, we must consider the kind of materials from which it originated, as well as the conditions under which these materials were, in the fulness of geological time, gradually transformed into the coalfields as we now know them. Our knowledge of these matters, of course, necessarily suffers from the recognized imperfections in the geological record, and therefore the scientific imagination has often to fill in gaps where precise information or definition is wanting. Therefore, while we are tolerably certain of the vegetable origin of coal, any view or theory concerning the factors and conditions operative at the various successive stages in the subsequent long transformation process is necessarily somewhat speculative, and subject to reservation. Certain well-attested features which stand out prominently in the record may, however, be regarded as more or less common ground.

Although many classes and varieties of coal occur in Nature, all of them represent some stage or product of the primary decomposition and subsequent transformation under the combined influence of slowly increasing pressure, and possibly also temperature, upon the vegetable *débris* of primæval forests and swamps. This process has gone on in nearly all the great geological epochs, and, so far as its early stages are concerned, is being repeated today, under somewhat different conditions, in our modern peat bogs and deltas, where enormous masses of water-logged vegetable *débris* are decomposing under bacterial influence.

Much controversy has waged round the question of whether or not coal formation has occurred upon the actual site of the original vegetable growth; and in certain cases the question can be answered affirmatively. The necessary conditions in such a case would be a dense forest growth in swampy areas (estuarine, or in great inland swamps) together with such rapid oscillations in level as are known to have occurred during the carboniferous period. The rotting vegetable *débris* would, during a period of subsidence, be overlaid with layers of water, deposited sands, and clays, which on re-elevation provided a suitable soil for renewed vegetable growth. Proof of such conditions is afforded by the occurrence of "under clays," with fossil roots (stigmaria), below the coal seams in certain areas. Some other coalfields, however, undoubtedly owe their origin to enormous masses of vegetable *débris* brought down from higher levels and deposited either in deltas or in land-locked seas or lakes. Such fields show no fossil roots in the under-strata, and in some cases fossil remains or aqueous and marine life are found immediately above and below the coal seams.

Such primæval swamp forests would, with gradual fall in level, become submerged to a greater extent, and be covered with water-borne soil and mineral matter, which, on subsequent re-elevation, would be ready for a fresh vegetable growth. Repetition of the process—*i.e.*, the ultimate gradual submersion and re-elevation—would produce several distinct deposits of decomposed vegetable matter separated by mineral matter of sedimentary origin, which would ultimately give rise to the various separate seams of coal found in our modern coalfields.

Finally, such successive deposits would, in the course of geological time, become buried as a whole under newer mineral strata, whose accumulation would "blanket" the incipient coal measures, causing a gradual increase in both temperature and pressure. Moreover, it is known that, during the later stages of the carboniferous period, the "blanketed" strata were subjected to intense seismic disturbances, the effect of which would be to cause great local increases in temperature and pressure. These causes, operating successively, would sufficiently account for the transformation of the original decaying woody tissue into bituminous coal and anthracite. Such changes as I have described would necessarily involve both great shrinkage in bulk and loss of weight in the original vegetable *débris*; and it has been clearly demonstrated that the existing coalfields represent about 20 to 28 per cent. only of the original weight, and 1-10th only of the bulk, of the original woody tissue from which they were formed.

CHEMICAL COMPOSITION OF COALS.

Turning, now, to the chemical composition of coals, from our knowledge of their origin and their mode of formation it may be anticipated that they will contain (*a*) various combustible, organic

compounds, complex in structure and of high molecular weight, representing degradation products of the cellulose and resinous matters contained in the vegetable *débris* from which they were originally derived, and (*b*) variable amounts of incombustible mineral matter, which remains behind as ashes when the coal is burnt, and represents partly the ashes of the original vegetation, or the soil in which it grew, and partly other associated mineral matter deposited or formed contemporaneously with the coalfield. The amount and composition of such "ash" varies considerably with the locality whence the coal is derived; and not infrequently the seams in a given mine show great variations in the amount and character of their ash content.

It is also necessary to distinguish between heavier mineral matter (dirt)—such as pyrites (specific gravity = 5·0), shales (specific gravity up to 2·5), or gypsum (specific gravity = 2·3)—often mixed with freshly-mined coal (specific gravity = 1·2 to 1·3), from which a separation can be effected by mechanical washing, and the true or fixed ash of the coal, which is disseminated throughout its entire mass, and cannot be so removed.

For purposes of comparison and classification of coal it is necessary to disregard altogether the variable proportions of mineral matter, as well as of mechanically held water, which they may contain, and to fix attention upon the character and composition of the coal substance itself. The following figures for the ultimate compositions of the principal dry ashless raw fuels comprised in the "wood to coal" series indicate that the net result of the transformation of the original vegetable *débris* into the combustible matter of our coalfields has been a progressive concentration in the carbon content and a corresponding diminution in the relative proportion of oxygen in the organic matter—a process which has been marked by a steady increase in the calorific value of the fuel.

Compositions and Calorific Values of Typical Solid Fuels (Dry and Ashless).

—	Carbon. Per Cent.	Hydrogen. Per Cent.	Oxygen or Nitrogen. Per Cent.	Calorific Value. K.C.U.'s per Ki'og.
Wood	50·0	6·0	44·0	4000 to 4300
Peat	50 to 64	4·5 to 6·8	28·6 to 44·0	5000 to 6000
Lignite	60 to 75	5·0	20·0 to 35·0	6000 to 7000
Bituminous coal	75 to 90	4·5 to 5·5	5·5 to 15·0	8000 to 9600
Anthracite	90 to 95	2·5	3·0	9200 to 9800

Incidentally, it may here be remarked how little has been accomplished in the way of exploiting the potential fuel value of the world's enormous stores of peat, which, according to some estimates, exceeds that of all the known coalfields. Nor can it be said that, except in Austria and Germany (which in 1913 raised for local consumption 27·4 and 87·1 million tons respectively), have the lignites come into extensive use as coals, owing to the inferior calorific value in the raw state, and their liability to disintegrate when their usually high content of moisture is expelled. The utilization of lignites is, or will be, an important matter for some of our over-seas dominions (notably Australia and Canada); but so far as Great Britain is concerned, the lignite problem may be regarded as non-existent.

The terms "bituminous" or "flaming" coals, of which there are many different varieties, include all the economically important coals except the anthracites. For commercial purposes they are classified according to their suitability for certain specific purposes—such, for instance, as steam raising, gas making, domestic heating, or the manufacture of strong metallurgical coke. The usefulness or otherwise of any given coal for a particular purpose depends principally upon: (1) The amount of volatile matter expelled from it when maintained at a temperature of 900° to 1000° C. out of contact with the air; and (2) the amount and character of the carbonaceous residue or coke (equals fixed carbon *plus* ash) after such volatile matter has been expelled.

Grüner's well-known classification of coals, which is still in my opinion the best for economic purposes, is based upon such data; and I will summarize its principal features.

Class I.—Highly bituminous coals, containing more than 40 per cent. of volatile matter which, on expulsion, leave a non-coherent residue and burn with a very long and highly luminous flame. They are chiefly valued for the firing of reverberatory furnaces and the like, where a long flame is essential, and are used to some extent as house coals. But they are not good for steam raising, and their non-caking character renders them useless for coke manufacture.

Class II.—Containing from 32 to 40 per cent. of "volatile," comprises all the best gas coals. They burn with a long luminous flame, and on distillation pass through a stage of intumescence, during which gas is fully expelled, yielding finally a fairly porous coke of no great strength.

Classes III. and IV.—These comprise all the best coking coals (volatiles, 20 to 32 per cent.), and, as such, are chiefly valued for the manufacture of hard metallurgical coke. They are not, however, suitable for steam raising, because, on burning, they form dense masses of hard coke in the boiler furnace, which can only be completely consumed in a very excessive air supply.

Class V.—This class, sometimes termed semi-bituminous or anthracitic, includes all the finest steam coals, which are usually feebly coking, and burn in a good draught with a short smokeless flame. They are subdivisible into two groups, as follows:

(*a*)	(*b*)
Semi-bituminous steam coals. Volatiles = 14 to 20 per cent. *e.g.*, the best Welsh "Admiralty" steam coals.	Anthracitic hard steam coals. Volatiles = 8 to 14 per cent.

Anthracites.—Coals containing less than 8 per cent. of volatile matter are classed together as anthracites. In Great Britain they are found for the most part in the west and north-west border of the South Wales coalfield (West Glamorgan, Breconshire, Carmarthenshire, and Pembrokeshire) over an area of 137,000 acres, and to a small extent in certain localities in Scotland (Ayrshire, Linlithgow, and Fife), where the bituminous seams have been subjected to the intrusion of molten igneous material subsequent to the formation of the original coalfield. Nearly 80 per cent. of the world's reserves of anthracite are located in China; and there are extensive fields also in Russia and the United States (Pennsylvania).

Anthracites are usually distinguished by their very low ash content and freedom from sulphur, as compared with bituminous coals; and, owing to their cleanliness and smokeless combustion, they are chiefly used for domestic heating in specially constructed closed stoves, for central heating furnaces, for drying malt, curing rubber, and for other special purposes where a smokeless fuel of great purity is required. The total quantity of anthracite raised in Great Britain in the year 1913 was 5,194,620 tons, of which 4,833,159 tons came from South Wales; and nearly 3 million tons were exported—chiefly to France, Italy, Germany, Sweden, and Holland. The advantage of anthracite for domestic heating is more appreciated upon the Continent (closed slow-combustion stoves are there largely used) than in England, where the open fire-place is the rule.

Until quite recently it has been generally believed that anthracites represent the final stage in the transformation of the original mother-substance of coal, through the intermediate stages represented by lignites and bituminous coals. In support of the view may be cited the fact that anthracites are found in areas which are known to have been subjected to great earth movements or igneous intrusions after the coalfields were laid. But the fact that in the South Wales coalfield, where the character of the seams gradually changes from bituminous to anthracite along a line running roughly south-east to north-west, the ash content diminished as the anthracitization increases is difficult to reconcile with the theory that the anthracite has been formed by the expulsion of volatile matter from the neighbouring bituminous coal; and it has been suggested that in this particular area the anthracite has been formed from a different type of original vegetable *débris*.

It is important to observe that, as a rule, the caking properties of a coal, as well as the strength and density of a coke produced by carbonizing it at a high temperature, vary inversely with the yield of volatiles, until they attain a maximum with 20 to 30 per cent. of volatiles, after which they rapidly diminish. Non-caking coals are principally either: (1) Those of greatest geological age, rich in carbon, with correspondingly low hydrogen and oxygen contents (semi-bituminous, anthracitic or anthracite; (2) those of more recent origin with a high oxygen content; or (3) those from oxidized seams, which at some period subsequent to the formation of the coalfield had become exposed to atmospheric influences—*e.g.*, Warwickshire and Leicestershire seams.

When, however, it comes to the consideration of the real nature of the various chemical compounds contained in coal, I am afraid a lamentable state of ignorance must be confessed. Perhaps the most suggestive of recent chemical researches upon coal are those which Dr. R. V. Wheeler and his co-workers have carried out at the Home Office Experimental Station at Eskmeals, in Cumberland, as part of the larger inquiry on coal-dust explosions in mines. They have closely studied the character of the gaseous products yielded by the decomposition of anthracitic, semi-bituminous, and bituminous coals at definite temperatures between 450° and 1100° C., and have established: (1) That at low temperatures (up to 500°) the gaseous products are chiefly methane and the higher paraffin hydrocarbons, while hydrogen is evolved in comparatively small quantities; (2) that the evolution of paraffins entirely ceases at about 700° C. (the absolute amount of methane reaching a maximum at 900°); and (3) that between 700° and 800° there is a critical point above which evolution of the hydrogen abruptly and rapidly increases.

Such results suggest the existence of at least two distinct types of organic compounds in coals—namely, (1) compounds of low stability, which readily decompose at temperatures between 400° and 700°, yielding, primarily, paraffin hydrocarbons and methane, but comparatively little hydrogen; and (2) a still more staple type which does not decompose until the temperature exceeds 700°, when it yields mainly hydrogen. All coals of carboniferous origin—*i.e.*, ordinary bituminous coals and anthracite—contain these two types of constituents; and it may prove that the difference between the various classes of bituminous coals are largely due to variations in relative proportions of the two types of compounds which they contain. Also, it seems probable that the least type of compounds, whose decomposition is mainly responsible for the smoke produced when a fresh charge of fuel is added to a fire, have been derived from the resinous constituents of the original vegetable *débris*, while the more stable (or humic) type,

whose combustion is smokeless, represent the degradation products of the original cellulose.

A separation of the two types of constituents may be effected by means of certain organic solvents. Some years ago, Professor P. Bedson, of Newcastle-on-Tyne, called attention to the remarkable solvent action of pyridine upon coal, and showed that if the coal be finely ground so as to run through a sieve of 1000 apertures per square inch, then mixed with sand and extracted with the solvent in a Soxhlet apparatus, a large proportion of the resinous constituents pass into solution. On evaporation of the solvent there remains a resinous residue which, as Dr. Wheeler has shown, is partly soluble and partly insoluble in chloroform. Thus it would appear that the coal substance may be divided into three parts—namely, a portion insoluble in pyridine (1), another portion soluble in pyridine but insoluble in chloroform, (2) and (3) a third portion soluble in both pyridine and chloroform. There is little doubt that while (3) represents the true resinous constituents, (1) represents the more stable humic bodies resulting from the degradation of cellulose. The precise nature of the intermediate second class is perhaps a little doubtful, and can only be cleared up by further research.

It has also been established that the resinous constituents, besides being relatively unstable, readily absorb oxygen at comparatively low temperatures, and that their extraction deprives the coal of its coking properties. Moreover, inasmuch as the coking properties of a strongly caking coal are known to diminish on prolonged exposure to atmospheric influences, it is fairly clear that the causes of intumescence and coking in certain classes of coal are to be attributed to the presence of the unstable resinous constituents which, on decomposition, yield paraffins and a pitchy cement, which acts as a binding material upon the residual humic bodies, and so plays a principal rôle in the ultimate formation of coke. It is also understandable why an oxidized coal seam is either non-coking or only feebly so.

Nitrogen in Coal.

Even a brief review as this of the chemistry of coal would be imcomplete without some reference to the occurrence of organic compounds of nitrogen and sulphur in the coal substance. Nitrogen, although present in coals to an extent of usually between 0·5 and 1·5 and at most 2 per cent., is a constituent of great economic value, inasmuch as it is the source of over 90 per cent. of the world's output of ammonium salts. According to the researches of Carrick-Anderson and Roberts, Hilgenstock, Christie, and others, the evolution of ammonia when coal is distilled, which begins at 330° in the case of gas coal and at 450° to 480° in the case of anthracites (the older in geological age the higher the temperature), reaches a maximum between 500° and 700°, and ceases altogether at about 900°. This ammonia probably arises from the decomposition of organic compounds, probably of an imino type, which are normally present in small amounts of all classes of coal. A very large proportion of the nitrogen, however, remains behind in the carbonaceous residue in coke, from which it is expelled as gaseous nitrogen as the temperature is raised from 900° to 1900°. Hence it would seem that nitrogen exists in coal in two forms—namely, (1) as compounds of an imino type, which decomposes below 900°, yielding ammonia, and (2) in a more stable nitride form.

In the actual distillation of coal on a large scale, whether in gas-works or in bye-product coking-ovens where ammonia recovery is carried out, it rarely happens that the yield of ammonium sulphate exceeds 30 lbs. per ton of coal, even though the latter may contain as much as 1·5 per cent. of nitrogen. Such a yield corresponds to about 20 per cent. of the total nitrogen content of the coal. The actual distribution of the nitrogen among the products of the distillation on a large scale is somewhat as follows:

	Per Cent.
As N in coke	40 to 50
As N_2 in gas	20 to 40
As NH_3	15 to 20
As organic basis in tar	3 to 4
As cyano compounds	1 to 2

A much larger quantity of ammonia may be derived from the nitrogen in coal by gasifying it in a generator of the Mond type in a superheated air-blast saturated with steam at 85° C. By such means as much as 80 to 90 lbs. of ammonium sulphate per ton of a suitable coal may be recovered, together with about 150,000 cubic feet of a gas containing approximately:

$CO_2 = 17{\cdot}0$, $CO = 11{\cdot}0$, $H_2 = 24{\cdot}0$, $CH_4 = 3{\cdot}0$, $N_2 = 45{\cdot}0$.

Although the capital cost of an ammonia recovery gas-producer plant of the Mond type is large, it is, nevertheless, a most scientific and economic means of utilizing coal for the production of gas for power and other large-scale industrial purposes.

Sulphur in Coal.

Sulphur is always a deleterious element in coal from every point of view. It exists chiefly in three forms—(1) as iron pyrites (FeS_2), (2) as gypsum ($CaSo4$), and (3) in the form of organic compounds in the coal substance itself. On carbonizing a coal in gas-retorts or coke-ovens, between a quarter and a third of the sulphur is expelled, chiefly as H_2S, CS_4 and thiophene, with the gases—the remainder being retained by the coke.

Want of Scientific Research.

In concluding my review of the present state of science concerning the chemical nature of coal, I must once more call attention to its incompleteness and the need of much more systematic research on the subject. Chemically speaking, coal is a substance of great structural complexity, and we hardly know anything at all about either the precise nature of its various constituents or their modes of decomposition by heat. It is true, of course, that we have gained considerable experience as to the yields of the various products (solid, liquid, and gaseous) obtained when bituminous coal is distilled under given conditions; but as to how they arise, we know practically nothing.

If anyone is inclined to question the justice of this statement, I will put to him one question. For the supplies of the high explosives which are essential to the successful prosecution of the war, we depend entirely upon the benzene and toluene obtained by the distillation of coal; and, according to our present methods of carbonization, the amounts of these products obtainable per ton are strictly limited. I would therefore ask whether anyone, from ascertained knowledge of how benzene and toluene are actually produced in the distillation of coal, can propose any certain plan or method for increasing the yields of these important substances. Can anyone, for example, suggest a plan for doubling the best yields hitherto obtained?

If, as I am afraid, such scientific knowledge or experience is not at the present moment forthcoming, we stand branded as mere empirics in a matter which is so vitally important to final success in this war. I am afraid I must also say that, in my opinion, the Ministry of Munitions, of whose activities we hear so much, have been guilty of culpable negligence in that they have so far disregarded all warnings and representations concerning the importance of organizing some competent chemical supervision of bye-product coking plants from the point of view of improving the yields of benzene and toluene, and that if we fail, as we may do, in keeping up adequate supplies of high explosives, it will be very largely for want of knowledge and insight on the part of those who have taken upon themselves the responsibility of organizing these supplies.

But, looking beyond the war to the period of economic recuperation, which will try our mettle even more than the war itself—two things above all are needed as a basis for the scientific utilization of our coal and the realization of all possible economies in regard to fuel consumption. The first is a systematic investigation of the chemical nature of coal, which may best be undertaken by a selected group of experienced chemists aided by adequate grants from public research funds. The second is a chemical survey of the principal British coalfields, which ought to be organized by a public Department, acting in conjunction with the laboratories which have been established for the special study of fuel technology at the Universities and other institutions for advanced research in applied science. We already have in the country all the means, as regards men and equipment, for the work; and it only remains for the authorities who administer money voted by Parliament for scientific and industrial research to provide adequate grants for its effective prosecution.

BUSINESS IN ENGINEERING.

That engineering, as it is known to-day, could not exist without its commercial side, was the argument advanced by Mr. F. G. Hatch, in a paper which he lately read before the Junior Institution of Engineers. In the ordinary course of things, an article has first to be designed; then the material to be worked upon must be purchased; next processes on the material are required, to form a manufactured article; and, lastly, the product must be sold and properly exploited. Commercial considerations must enter very largely into the question of design and manufacture; and technical excellence must be given due weight in the buying of raw material and the selling of the finished article, if all-round success is to be attained. This is an aspect of their work which Mr. Hatch thinks is not sufficiently borne in mind, especially by the younger engineers; and he warns them that the present is a commercial age, and it is inevitable that anyone failing to combine business ability with technical skill is doomed to limited advancement. It is of the utmost importance, therefore, that engineers should be good business men. To assist towards this end, the suggestion the author made was that the usual routine of practical training might well be varied. After the customary round of the shops, some time might be spent in the general offices—commencing (say) in the accountant's department—followed by a period in the costing office, then in the estimating department, and finally in the drawing office. The value of this business interlude, after the practical work of the shops, would, he says, seem to be very great. For one thing, it would give those whose inclinations lay in the direction of a business career a chance to find themselves in a position where this would be noted. Thus the business and commercial positions could gradually be filled by men who had commenced their training as engineers, and who would be regarded by their technical associates as in the same profession as themselves.

The Treasury has re-appointed Mr. W. A. Schultz, J.P., F.C.A., to act as a Public Auditor for the purposes of the Friendly Societies Act, 1896, and of the Industrial and Provident Societies Act, 1893 to 1913, for the year ending Dec. 31, 1916, for the United Kingdom.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

Visit to the Johnstone Gas-Works.

Last Saturday, members of the Association to the number of about seventy visited the Johnstone Corporation Gas-Works. They were met by Mr. James Dickson (the Engineer and Manager), who showed them a plan of the works, and explained the general idea on which they were laid out, and the provision made for extension.

The retorts are of the Wilson-Glasgow vertical type, with a capacity of 550,000 cubic feet per day. Unfortunately, the size of the condenser and scrubber plant is less than this; and they sometimes had gas containing tar reaching the purifier. The capacities of the two holders are 350,000 and 250,000 cubic feet respectively. A tar-dehydrating and benzol-recovery plant has been installed, and has worked very satisfactorily on the first trial which they have been able to make with it.

The party were conducted over the works, after which they went to the Town Hall, where they were welcomed by Provost Armour and entertained. In the course of his welcome, after apologizing for the absence of Provost Lang, who was away on business as a member of the Munitions Committee, Provost Armour gave a short account of the progress made in Johnstone. In spite of their recent high capital expenditure, he said, they had reason to be proud that they could sell gas cheaper than most. It was only 1s. 10d. per 1000 cubic feet, but had, owing to recent advances in the price of coal, to be raised to 2s. 4d. They were progressive in Johnstone, and were looking ahead; and within the last year they had spent over £2000 in laying mains to the village of Howood. They did not expect an immediate return for this outlay; but they had got their gas into Howood, and anticipated a good result in years to come. He was glad to say Mr. Dickson enjoyed the full confidence of the Council, even although they required of him the why and the wherefore of all he proposed.

Mr. David Fulton (the President) replied, and was followed by Bailie Aitken, who said that things were very much changed from the time when he first entered the Council. Then, the Council looked askance at delegates and meetings of the kind they had the pleasure and opportunity of entertaining that night. Now, he was glad to say they had adopted a more enlightened policy. They welcomed such meetings, because they recognized that the visitors were bent on the serious business of making themselves conversant with as many modern methods as possible. The members advantaged by such visits; and they carried the ideas obtained into their own works, and thereby benefited the corporations or companies who employed them. He was also glad that they were able to entertain them, because it was his opinion that the development of better social intercourse between officials of different corporate bodies was as much for the good of the employers as for the employees. He would like to pay Mr. Dickson the same compliment as the Provost; for Mr. Dickson had proved himself a worthy successor to those who had preceded him.

A very pleasant evening was spent with song and story.

Laying Mains Under Water.

A recent issue of "Engineering News" (New York) gave an illustrated account of the laying of a new 36-inch cast-iron water-works intake at Quincy, Illinois, to replace a 30-inch wood-stave pipe-line. The initial operation in the laying of the pipe was to place four 12-feet bell-and-spigot lengths on skids, parallel to the shore line, and connect them by ordinary lead joints caulked by pneumatic hammer. These 48-feet sections were made up with a 6-inch bell forward, and a machined spigot at the rear end. A bead had been cast on the pipe 18 inches from the special spigot. The lead joint was poured into the 6-inch bell around a cast-iron form turned to the exact shape and size of the machined spigot; and after the lead had set, the form was removed. Heavy steel clamps were bolted around the pipe, back of the forward bell and around the bead on the spigot end. When a section was to be taken out for laying, a large scow was anchored with the A-frame derrick over the section to be hoisted. Two hitches were taken around the pipe, which was hoisted off the skids; and the scow was pushed out to an anchorage over the site. When the trench was reached, the section was lowered; and with the help of a diver the spigot end was led into the bell of the preceding section. Bolts were passed through the clamps bolted around the bell and spigot; and by tightening the nuts on the bolts, the spigot was forced into the cold lead in the bell. A diver then caulked the lead around the pipe with a pneumatic hammer. The clamps and bolts were left on the pipe to strengthen the joints. No back-filling had to be done, as the sand drifted into the trench quickly; and within a few hours the pipe was entirely covered.

Mr. A. K. M'Cosh, ex-Provost of Coatbridge, died on Saturday at his residence, Cairnhill, near Airdrie. He was head of the firm of Messrs. William Baird and Co., of the Gartsherrie Iron-Works, and was widely known throughout the iron and products recovery trades.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

German Enterprise and "French" Pipes.

Sir,—It will, of course, be a matter of common knowledge to your readers that during the last ten years a large and constantly increasing quantity of (so-called) French pipes have been used in this country, particularly by gas and water engineers. The reasons for this were: (1) The cost compared favourably with that of English pipes; (2) they were cast vertically; (3) they were supplied in 3 or 4 metre lengths, even in smaller diameters (below 6 inches).

One of the principal sources of these pipes was "La Société Metallurgique d'Aubrives et Villerupt," whose foundry at Aubrives was visited by the British Association of Water-Works Engineers (now the Institution of Water Engineers) in the year 1904.

The popularity of these "French" pipes has no doubt profited by the "*Entente Cordiale*:" and, as a result of the present war, it is probable that their popularity will be greater than ever—assuming that they are again offered on the English market on similar conditions to those prevailing before the war.

With this prospect in view, it seems well worth while to reveal certain facts the writer has just gleaned from a French book entitled "L'Allemagne en France" by Louis Bruneau [Librairie Plon, Rue Garanciére, Paris]. This book explains in detail the procedure adopted by German metallurgists, ironmasters, &c., to secure the control of the French iron mines and foundries. The opportunity for this procedure has arisen in the first place from the fact that France is well provided with iron ore, but is deficient in coal; while the reverse is the case in Germany. Collaboration on equal terms would no doubt have been possible, and would have been a mutual advantage to both countries; but the superior methods adopted by German firms, in regard to finance, administration, and efficiency and economy of manufacture, have enabled them in process of time to gradually but completely monopolize the control of the French companies. The means adopted towards this end have been thoroughly German—that is to say, there has been plenty of business "smartness," but a marked absence of commercial honesty.

It is not, however, the purpose of the writer to retail the contents of this book in the form of a letter, but to direct your readers' attention to the fact that the Société Metallurgique d'Aubrives et Villerupt is at the present moment controlled by the German Trust "Gelsenkirchen" and its very influential head, Herr Thyssen. It is therefore to be noted by all English gas and water authorities and engineers that, in placing orders with this firm, they have been benefiting Germany rather than France—at any rate, since the year 1909, when the German control was consummated.

At the present moment the Aubrives mines and works are, the writer believes, in the hands of the German troops; and it is impossible to foresee what will happen to them by the time the war is over. But unless and until these and other French pipe foundries are released from German control, all English engineers should be urged to avoid (so called) French pipes at any cost.

ANTI-GERMANICUS.

Jan. 18, 1916.

Labour and the War.

Sir,—There must be a number of men who were employed in gas-works who have done their "bit" in this disastrous war, and having been partially disabled, and unfit for further military duties, are quite capable of carrying out the duties of stoking machine drivers, telpher drivers, and carburetted water-gas operators. I would suggest that steps should be taken to get a record of these men, so that they could have preference when any vacancies occur.

The reading in the technical papers of the numerous strikes and labour troubles in these times is very distressing; and it is to be hoped that they are caused in most cases by the very unsatisfactory substitutes which the different works have had to put up with. It is, to say the least, very galling to see a number of young men of military age at different works taking advantage of the present shortage of labour to press unreasonable demands—trusting to the shortage of labour and a war badge to prevent their being enlisted. Most undertakings would prefer to give extra remuneration to those who answered the country's call in her time of need, and dispense with the unsatisfactory labour of the slackers, who will neither carry out their work satisfactorily nor do their "bit."

REGISTER.

Jan. 18, 1916.

The Jarrow Train Disaster.

Sir,—For some weeks past I have read with interest the correspondence upon the Jarrow train disaster, and certainly think that many of the remarks relate to a matter of opinion, based upon circumstances which generally exist in such disasters.

The engineers and witnesses did not state that they know for certain the prime cause of the fire. I have been told, in good faith, that wax vestas packed in parcels in the mail bags being sent away to H.M. Forces were the cause of the fire, and that these became ignited when the impact was felt.

This was quite obvious upon examination of the mail bags. The smell of these matches in mail packages is of frequent occurrence, and discloses the nature of the contents. If this statement is correct, it is surprising that nothing has been said upon this particular point. It may possibly help to remove some of the blame put upon the gas apparatus.

We should always try to remember that both gas and electric light have their uses; but we should be fair, and get the true cause of the fire, then fix the blame.

CHRIS. J. STIFF.

115, *Stockwell Road, S.W., Jan.* 21, 1916.

Increased Toluene Production.

SIR,—In the coal-liming experiments, the coke was quenched without delay, in the usual manner—using a quencher and hose pipe. Hence, the obvious presence of lime must be due to the oxidizing action of generated steam.

The whole theme of the article in question was centred on lower carbonizing temperatures being conducive to increased toluene production; and no special working temperature was advanced, the figures relating to the yields of aromatics under various thermal conditions being given.

The results of coal-liming at a gas-works were taken from the "Gas Chemist's Summary," 1913; and should Mr. Beeston care to turn to them again, he will find the "percentage of lime added," where his calculation is based on the assumption that limestone was used.

A theoretical calculation on the lime basis gives a figure which approximates to the ash content quoted; the slight discrepancy allowing for sampling errors.

B. DUNGLINSON.

Jan. 22, 1916.

Price of Heavy Naphtha.

SIR,—With reference to the price of heavy naphtha as given in the "JOURNAL" for the past few weeks. This is quoted by you as 1s. 2d. to 1s. 3d. per gallon, which we consider altogether out of it as far as the actual market value is concerned. And very misleading indeed. Our own experience is that we have not the slightest difficulty in getting anything from 1s. 9d. to 1s. 10d. Also we cannot buy any at less than these prices. We should like to hear from any other firm who can buy this article at the prices you quote. We presume that the price is arrived at from actual sales—say, during the past month. However we should be agreeably surprised to hear that it is possible to obtain this article at the "JOURNAL" price.

E. HARDMAN, SON, AND CO.

Hull, Jan. 20, 1916.

REGISTER OF PATENTS.

Gas-Purifiers.

MILBOURNE, R. J., of Donnington, near Newport, Salop.

No. 2768; Feb. 20, 1915.

The patentee proposes to employ a junction-box, composed of two cylindrical chambers or pipe sections which communicate with the upper and lower sides of the purifier and with a space between their adjacent ends, in which is a disc-valve surrounded by a casing connecting the two cylindrical chambers or pipe sections, and in connection with which is the junction-piece for the gas-main. The valve seats against the end of either of the chambers or sections in such a manner that, when the valve is in contact with one seat, the flow of gas will be cut off from one end of the junction-box, and will be allowed to flow through the other end of the junction-box from the inlet. If the valve at the inlet end of the purifier is in a position to shut off the gas from the upper part of the purifier, and the other valve is open to the upper end of the purifier, the gas flows through the purifying material from the bottom upwards; but if the positions of these two valves are reversed, the flow is in an opposite direction.

Fig. 1 is a sectional elevation of an inlet valve and parts in connection with one end of a purifier. Fig. 2 is a front elevation. Fig. 3 illustrates a modification.

In figs. 1 and 2 A B are the upper and lower cylindrical chambers or pipe sections in communication at their outer parts through the openings C with the upper and lower sides respectively of the purifier. The casing is rectangular in shape, and into it the inner or adjacent ends of the chambers A B open. E is the gas inlet fitted to the casing D. F is the disc-valve within the casing between the inner or adjacent ends of the chambers A B; while G are lateral guiding lugs upon the valve which engage with the guides H in the casing D to ensure the proper application of the valve on the seats.

When the valve F is seated on the chamber B, by turning the spindle I the gas to be purified enters the inlet E and passes into the chamber A, whence it issues, through the openings C, into the upper part of the purifier. It then passes downwards through the purifying material to the outlet valve—of similar construction to that shown, but in which its valve F is seated against the upper chamber, so that the gas enters the chamber B and thence passes to the outlet branch E. By reversing the positions of the inlet and outlet valves the gas is caused to pass through the purifier from below upwards. M is a lateral hole in the casing D, closed by a cover which serves for the removal of the disc-valve for repair or any other desired purpose.

In the construction shown in figs. 1 and 2 the gas to be purified enters and leaves the purifier laterally. Where it is desired that the gas shall enter and leave through the bottom of the purifier, the rectangular casing D is furnished, as shown in fig. 3, with an additional box O, which forms a passage from the opening P in the bottom of the purifier to the casing D.

The patentee points out that not only is it possible by his invention to cause the gas to be purified to flow through the purifying material of any purifier either in an upward or a downward direction at will, but also the same regulations may be effected in any individual purifier of a set, so that the gas can pass upwards through the purifying material in one purifier and downwards through the material in the others of the set.

Fluid-Meters.

HODGSON, J. L., and GRAY, F., of High Holborn, W.C.

No. 21,258; Oct. 20, 1914.

The object of this invention is to provide simple means for measuring a pulsating flow, but is applicable to the measurement of steady flows—the meters being of the type in which the measurement is obtained from the movements of a hinged flap moved by the passage of the fluid to be measured.

The patentees claim; (1) In connection with fluid-meters, a method of measuring the true mean value of a pulsating flow of any periodic wave form by obtaining a motion proportionate to the flow and conveying this motion to a damped pointer through a flexible coupling, so designed that the force exerted between its two parts, when these are relatively displaced, varies according to a law which is so related to the law of damping that at any instant the rate of motion of the pointer is proportionate to the amount of relative displacement of the two parts of the coupling. (2) In connection with meters of the hinged-gate type, methods of obtaining a movement of the gate approximately proportionate to the flow. (3) In connection with meters of the hinged-gate type, and with meters which measure the flow in terms of a differential pressure in which a movement approximately proportional to the flow is obtained by means of shaped floats and bells, the methed of obtaining an indication of the true mean rate of flow when measuring on a pulsating load by transmitting a motion which is proportional to the flow at every instant through a hair spring to a pointer, the motion of which is damped by one or more vanes moving in oil.

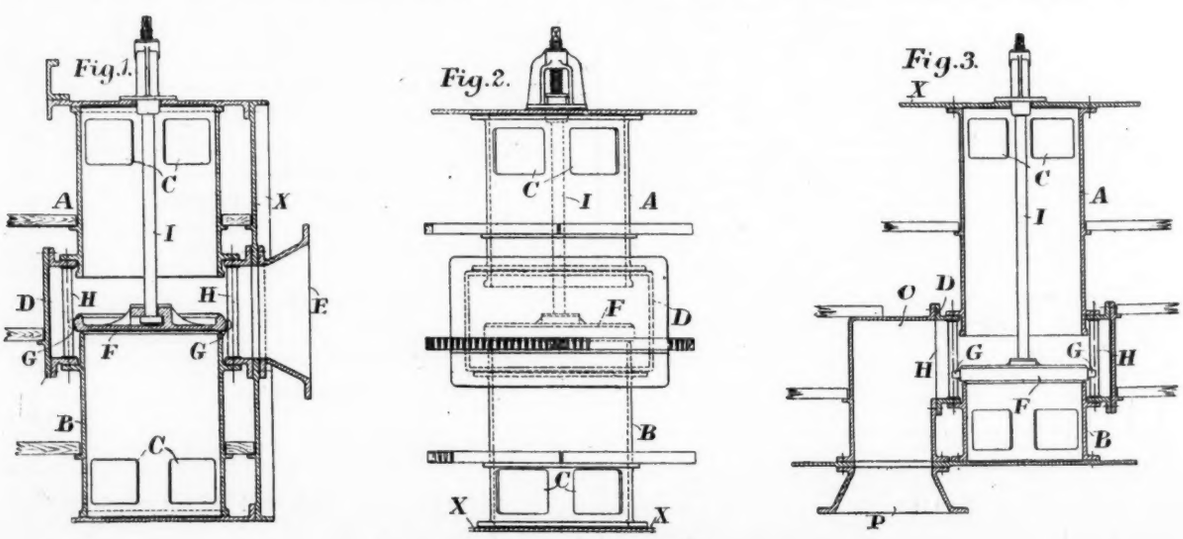
Inverted Incandescence Gas-Lamps.

GROB, H., of Zurich, Switzerland.

No. 1360; Jan. 27, 1915.

This invention relates particularly to lamps for use in railway carriage compartments and as head-lights for locomotives.

The patentee claims as his invention: An inverted incandescence gas-lamp for use with high-pressure gas having the incandescent body surrounded by a heat-resisting body, consisting of a quartz capsule of approximately the same shape as the incandescent body and the inner diameter of which is such that the burned gases, passing through the incandescent body, travel freely upward, but small enough to retain the heat of the flame. A suitable diameter is said to be three times the radius of the incandescent body. The quartz capsule has a light absorption capacity of 10 to 25 per cent., and is of such a thickness that the



Milbourne's Gas-Purifiers.

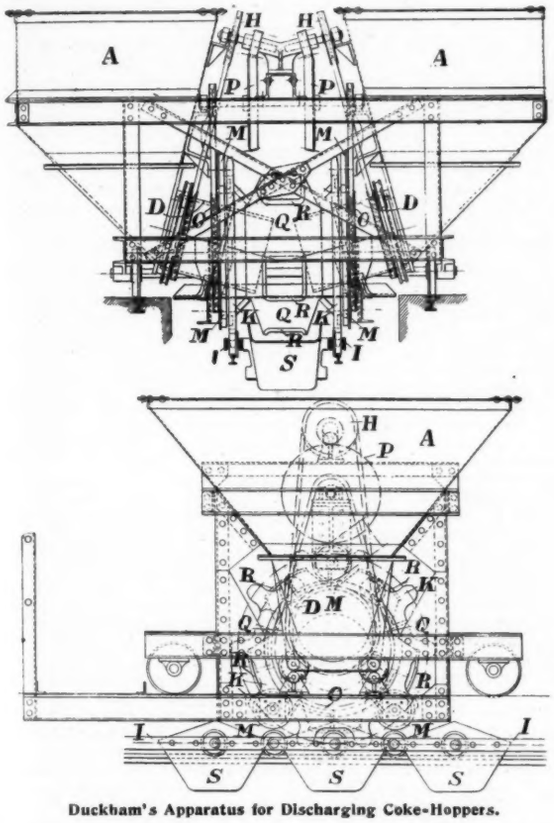
quantity of light absorbed by it is "at least replaced or balanced by the increased illuminating power resulting from the increased temperature of the incandescent body."

Discharging Coke-Hoppers.

DUCKHAM, A. M'D., of Ashtead, Surrey.

No. 85; Jan. 2, 1915.

In this apparatus for discharging coke-hoppers, the discharge shoot is a cylinder rotating on its axis—inclined at such an angle as permits the discharge of the coke when the cylinder is set in rotation, but not when it is stationary. Owing to the rotation, the coke travels downwards, and "is delivered without the breaking action which is inseparable from a worm conveyor." When used in conjunction with a bucket conveyor, the latter drives the cylinder, and an intermediate revolving shoot receives the coke and discharges it into the conveyor buckets as they arrive in turn below it.



Duckham's Apparatus for Discharging Coke-Hoppers.

This construction is illustrated (as applied to two hoppers adapted to collect coke from gas-retorts) in end and side elevation.

The hoppers A are mounted in a frame which runs on rails at the sides of the conveyor pit. The inclined cylinder D, which forms an extension of the lateral discharge opening of the hopper, is mounted at its inner end on four rollers carried by the hopper, and at its middle on two rollers carried by brackets on the framing. It is driven by a belt from a pulley H—itself driven from the conveyor chain I in the following manner: The chain engages a toothed ring K surrounding the cylinder D and provided with a bearing ring whereby it is carried on three rollers M—one mounted on brackets on the hopper and the others on the bottom member of the framing. To the bearing ring is fixed an annular belt pulley O, through which is driven the shaft of a gear wheel P engaging a toothed wheel on the shaft of the pulley H. Co-axial with the toothed ring K, and fixed to it, is a drum Q having on its periphery five discharging mouths R. The drum Q acts as an intermediate shoot, and the pitch of the ring K is such that as each discharging mouth turns into its lowest position there is a bucket S in position to receive the coke.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Export of Incandescent Gas-Mantles.

Mr. JOYNSON-HICKS last Wednesday asked Mr. Bridgeman (as representing the War Trade Department) whether, in the list of prohibited goods issued by the Department on Nov. 29 last, there was no prohibition of incandescent gas-mantles, but their export was prohibited without a licence because they were dipped in thorium, which was a prohibited article.

Mr. BRIDGEMAN replied that the answer was in the affirmative. The classification of prohibitions was being considered at the present time, and it was intended to make such improvements therein as were possible.

LEGAL INTELLIGENCE.

LEISTON PUBLIC LIGHTING CONTRACT.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Saturday, Jan. 22.

(*Before Mr. Justice* LOW).

Leiston Gas Company, Limited, v. Leiston-cum-Sizewell Urban District Council.

This action, which raised a question as to the liability of authorities in respect of public lighting contracts, having regard to the regulations under the Defence of the Realm Act, was originally set down for hearing as a short cause. When, however, the case came before his Lordship [see "JOURNAL" for Dec. 21, p. 651], he remarked that it might raise points of far-reaching importance, and he should not try it as a short cause. The action was ordered to stand over until the present sittings; and he heard the arguments on Saturday—reserving judgment at the close. The Company claimed £157 15s. 9d. for services rendered to the Council under a contract entered into in 1911. The defendants denied liability, on the ground that the Company had not supplied gas during the period for which they claimed, in consequence of an order made by the military authorities.

Mr. MATTHEWS, K.C., and Mr. RAYNER GODDARD were for the plaintiffs; Mr. HAWKE, K.C., and MR. POYSER, for the defendants.

Mr. MATTHEWS, in opening, said that the Gas Company were claiming £157 15s. 9d., being three quarterly sums payable at the end of March, June, and September, 1915, under a contract in writing dated June 2, 1911. The short point in the case was one with which nearly everyone, particularly Londoners, had become unhappily familiar, on account of the decreased lighting. From Jan. 1 to 24, only 26 lamps out of 107 were allowed to be lighted; and after the 24th no lamps at all could be lighted in the district. The case for the Council was that the orders made under the Defence of the Realm Act had prevented the performance of the contract, and that therefore the payments agreed upon were not due; but the Company's contention was that the orders had only hindered or temporarily impeded the performance of the contract.

His LORDSHIP: I have read the contract; and it is not only one to supply gas. There are standards and other things to be provided.

Mr. MATTHEWS replied that it was a contract for five years at least; and the Company had to erect, fit up, and connect with their mains over a hundred standards. They expected to recover their initial outlay by the contract running over a period of at least five years. That which had happened had in no way interfered with the obligation of the Company, for instance, to clean, repair, and maintain the lamps. In the event of the case being decided in favour of the Company, there was no dispute about the facts or the sums claimed.

Mr. HAWKE (for the Council) stated that the district had been in darkness since Jan. 24, 1915; and yet they were asked to pay the Company £157. Mention had been made of the gas-standards. They were erected to illuminate, not to beautify, the locality; and he submitted that the contract was essentially one for lighting. If, then, illumination became illegal, the contract was at an end. The Council never contracted to pay for the lighting of Leiston when the lighting was prohibited by a higher authority. He argued that payment for lighting during a period when it was illegal to supply light could not be enforced.

His LORDSHIP asked if there was any authority at all that a contract can be suspended.

Mr. HAWKE said if his Lordship was against him on the point that the contract had been determined, he contended that the contract was suspended by order of the competent military authority; and that the Company in this case could not enforce payment for lighting during the period when it was illegal to supply the lighting.

Mr. MATTHEWS, in reply, contended that the effect of a law which operated to the interference of a contract did not apply. The order of the military authority did not justify the Council in saying that the contract had come to an end. The fundamental proposition in considering the authorities his learned friend had quoted was whether the performance of the contract was interfered with by an act of God, by the Legislature enacting something which rendered it illegal, or by the action of the Executive Government which was binding on the parties. His Lordship must have regard to the length of the contract period, the question of whether the contract was capable of being performed, and the question of whether it had been put an end to by the circumstances which had arisen. His submission was that the contract was more or less capable of performance.

His LORDSHIP: The contract provides not only for the supply of lighting, but for the provision, at the expense of the Company, of standards, lamps, and other things, and for the maintenance of the apparatus. It also provides for the payment; but it is impossible to distinguish the amount of payment, and how much of it is applicable to work done and apparatus supplied, and how much is applicable to consumable material supplied. This being so, one of the difficulties which has occurred to me is this: Are the Gas Company, because, through no fault of their own, they are unable for the present to go on supplying gas, to lose all the initial outlay which they have incurred in respect of the apparatus they have provided? If the proposition of the Council is a sound one, the Company on Jan. 25 could have removed all their plant, as their contract was at an end. Supposing the Local Authority had objected, on the ground that they were going to pay as agreed in the contract? Here we are dealing with a comparatively small place; but is it conceivable (say) in one of the Metropolitan boroughs, that, in such circumstances, they would allow the gas contractors to remove the whole of their plant from the borough, if they could help it? After further argument, his Lordship said he had no doubt which way his judgment would be; but as he wanted to look into the cases cited, he would deliver judgment in a few days.

MISCELLANEOUS NEWS.

ELLESMERE PORT GAS ARBITRATION.

On Monday of last week, at the Surveyors' Institution, Great George Street, S.W., the hearing was commenced of an arbitration between the Ellesmere Port and Whitby Urban District Council and the Shropshire Union Railways and Canal Company, to determine the price to be paid by the Council for the Company's gas undertaking. Mr. A. J. RAM, K.C., was the Arbitrator.

Mr. HONORATUS LLOYD, K.C., and Mr. A. M. PADDON (instructed by Messrs. Potts, Potts, and Gardner) appeared for the Shropshire Union Company; Mr. W. E. TYLDESLEY JONES (instructed by Messrs. Baker and Sons), for the Ellesmere Port Council.

First Day's Proceedings.

Mr. HONORATUS LLOYD, in opening the case, stated that the arbitration was taking place under the Council's Act of 1914, which confirmed an agreement made between the parties in that year. Under this Act and agreement, the Council compulsorily expropriated the Company of their gas undertaking; and though, no doubt, the ordinary principles which one was accustomed to apply to these matters would apply here to a great extent, there were certain things which were unusual, by reason of the fact that the gas undertaking which was being acquired was really a portion of a much larger concern—the Shropshire Union Railways and Canal Company's undertaking. The agreement provided for the sale of the works and plant, but not for the site on which the works were erected. There was also excepted from the sale all pipes, meters, lamps, and fittings on the Company's premises provided for the Company's own use. The Council were, within six months of the transfer day, to remove from the Company's premises all the works and plant included in the purchase, making good any damage caused in so doing. The Company were to be entitled to all rates, rents, and profits accrued due, and to discharge all liabilities up to the transfer day; incomings and outgoings being apportioned as far as might be necessary. The Company were until the transfer day to carry on the undertaking according to their usual course of business, and to give to the Council all reasonable facilities for connecting, altering, renewing, or repairing the mains and pipes, whether before or after the transfer day, as might be necessary to secure that there should not be any avoidable interruption in giving a supply of gas to consumers within the district of the Council. The day appointed for the completion of the sale and the payment of the consideration was fixed at nine calendar months after the giving of the Royal Assent to the Bill [the Royal Assent was on July 31, 1914]; "and if from any cause all or part of the consideration payable by the Council to the Company on that day shall not be so paid, the Council shall pay to the Company interest after the rate of 5 per cent. per annum on the moneys remaining unpaid from the transfer day until payment thereof." If from any cause the purchase was not completed on the transfer day, the Company were to carry on the undertaking and retain the profits; the Council indemnifying them against all liabilities. The purchase of the undertaking was to be deemed to be a compulsory one. Until recently, the district would have been described as lying on the banks of the Mersey; but when the Ship Canal was made, it was constructed so as to intervene between the Mersey and the main part of this district. The Company obtained their statutory powers in 1913, and owned just over 200 miles in length of canals. In the Ellesmere Port district, the Company had docks, quays, warehouses, &c. Of course, the canal business grew from time to time; and in 1863 the Company established gas-works for the purpose of supplying themselves. The Company were, however, asked in the following year by a number of people who lived in the district to give a public supply of gas, and this they did, at the same time making provision for furnishing some of the public street lighting. The population of Ellesmere Port then consisted very largely of the employees of the Company. When, about 1892, Wirrell became an urban authority [Ellesmere Port was a parish inside the Wirrell area], in regard to the lighting of the streets of Ellesmere Port, they applied to the Company to give them a supply of gas for street lighting. This being so, the Company thought it wise to make it quite clear that they had power to supply gas and to charge for it; and therefore in the London and North-Western Railway Bill of 1893 they inserted a clause conferring upon them powers to give a supply.

The ARBITRATOR: What was the connection between them and the London and North-Western Railway?

Mr. HONORATUS LLOYD replied that the Company were leased in perpetuity to the London and North-Western Railway Company. The clause provided that the Shropshire Union Company should not, by virtue of the powers thus conferred upon them, be deemed to be a company empowered by Act of Parliament to supply gas within the meaning of section 3 of the Gas and Water Works Facilities Act, 1870. In 1902 Ellesmere Port was made an urban district; and the public supply was still given to them by the Company. A new agreement for this was come to in 1907; and during its existence—certainly from 1907 to 1913—considerable extensions were made by the Company at the request of the Urban District Council. Then followed the negotiations which ended in the Act to which he had already referred. Ellesmere Port itself had gone ahead very rapidly; for it had now many advantages for commercial purposes. The population in 1901 was 4275; and ten years later it was 10,366, while for 1914 the estimate was 12,000. In like manner the rateable value, which in 1903 was £14,221, had risen to £52,370 at the present time. There were 191 gas consumers in 1904; in 1914, there were 959. Of course, it went without saying that, had the undertaking been left in the Company's hands, it must have had a very substantial future before it. There were a great many houses available to become gas consumers—something over 1400 not yet using it. The undertaking was probably more valuable to the Company than it could be to the Council, because they had the opportunity of getting materials in the very cheapest market, and so could carry on the concern much more economically than the Council could ever hope to do. There might be some dispute as to which was the proper year to take for capitalization. They were now affected by the war; but this check was not going to be a permanent one. Though there was a set-back for the moment, it was a set-back due to circumstances with which they were all unfortunately familiar. In this case it was not a very big set-back; but at the same time it would not be fair to take as a standard or normal year to capitalize a period such as the present, when these conditions existed. If the Arbitrator took the year 1913, which he was going to submit as a normal standard, the Company would show a profit upon the trade they had done, apart from the trade with themselves, of just over £1800. From the supply to themselves, reckoned as a bulk supply, at a discount of 15 per cent., and a further 5 per cent. for cash, in 1913 the profit would have been £379. When necessary deductions were made, the maintainable revenue arrived at was in round figures £2100, to which they suggested 22½ years' purchase should be applied. There would be a claim in respect of surplus works of a little under £2000. Then there were the officials. The Company had no separate staff for the gas undertaking; and the result was that, taking the higher officials, they would be landed in the general undertaking with certain costs in connection with the salaries of these officials, for which no provision was made. This, taken at ten years' purchase, they put at about £1800. Then there was the capital expenditure of £535 which had been incurred since 1913. The Council were not to have the site, but would have to build new works elsewhere. As, however, the purchase was a compulsory one, what had to be considered was the value of the undertaking to the Company; and the Council were not entitled to any allowance by reason of having to build new works. The amount deducted in respect of the land was £200. In round figures, the total figures arrived at by his two witnesses were £55,000 and £53,000 respectively.

The following evidence was called on behalf of the claimants:

THE ACCOUNTS.

Mr. *William Cash*, examined by Mr. PADDON, stated that he had examined the accounts and other matters material to the inquiry. No absolutely separate set of accounts had been maintained in respect of the gas undertaking. There were separate records, for instance, of the revenue receipts; and the wages were allocated separately where the men were directly employed on the gas-works. But there had been no making up of a set of gas accounts; and therefore the figures had had to be abstracted from the general books of the Company. He had, however, been able to make a satisfactory abstract, and had submitted the figures to Mr. Keen, who was acting for the Council. In fact, the accounts were agreed, subject to observations upon them, and to certain questions of principle. Up to 1913, the figures reflected normal working. The houses supplied with prepayment meters were not fitted up by the Company. That was to say, there were no fittings; and this would make a considerable difference in the matter of repairs. The gas used by the Company for their own purposes had been calculated at cost in his tables; and if any alterations were made—if there was an additional charge put in under any one head—this, of course, would run the cost up, and a proportion of the additional cost would fall on the gas used by the Company. Some allowance ought to be made under the head depreciation of stoves. At 7½ per cent. on diminishing value in 1913, the figure would be £35 or £36. There was an item in the accounts for the first half of 1915, which had been compiled at the request of the Council: "Prepayment meter shortage, £169 13s. 7d." When the figures were gone into, it was found that the quantity of gas sold according to the meter readings did not correspond with the coins taken from the prepayment meters. He had no doubt the gas was actually supplied; but there was this discrepancy, probably extending back into the previous year. The leakage had been brought down; and the number of consumers had been steadily growing of late.

Cross-examined, witness said that, as the London and North-Western Railway were the lessees, it was no doubt a fact that the capital expenditure, at any rate of recent years, in respect of the gas undertaking, appeared only in that Company's books. It would mean a lot of work to pick out all the figures; and consequently they had not before them what would in the ordinary sense be a capital account. In 1911, the price of gas to ordinary consumers was 3s. 9d. and 4s. per 1000 cubic feet, less a discount of 5 per cent. for payment within a month. The price was reduced in 1913 to 3s. 6d. and 3s. 9d.; and the revenue went up. The usual tendency was for a reduction in price to stimulate consumption; and to a certain extent conversely, an increase in price tended to restrict consumption. In 1914 the revenue from the supply to private consumers fell slightly; but, on the other hand, the prepayment consumers yielded a much larger revenue. As a matter of fact, the number of prepayment consumers had increased in 1914 over 1913 by about 93. The consumption per consumer was slightly less. In 1911 and 1912, the price to ordinary consumers was 3s. 9d. and 4s., and to prepayment consumers, including meters, 5s. 2½. Thus, the addition for prepayment consumers was 1s. 2½d. per 1000 cubic feet. For 1913 and 1914, however, the extra charge was 5d. Considering the consumers were not getting internal fittings, the charge of 1s. 2½d. was distinctly high. He did not know how the reduction was brought about.

Mr. TYLDESLEY JONES: Is it not exceedingly unusual to have the same price charged to the local authority for public lighting as to private consumers?

Witness: There is a difference of 3d. here.

No; the large private consumer pays 3s. 6d. per 1000 cubic feet. Is it not usual for a public lighting authority to obtain more favourable terms than such a consumer?—It is not unusual. Everything depends upon the particular circumstances and the particular terms of the contract. Going back a little, the price for public lighting was 3s. 6d., against 4s., for quite a number of years.

After 1914, when the power of determining the agreement came into force, is it, in your opinion, fair to take the price of 3s. 6d. as the price which the Local Authority would have continued to pay?—I do not see anything unfair.

The Local Authority, in fact, pay more than the private consumer,

because the latter gets 5 per cent. off for payment within a month, and the Council get nothing?—Yes; that is so.

Cross-examination continued: The cost of the supply to the Company themselves was figured out at 2s. 1·19d. per 1000 cubic feet. There might be some expenses included, as it was reckoned on the total cost of gas sold, which did not actually apply to the gas taken by the Company; but the amount would be very small. Repairs to mains on the Company's own premises would not be charged to the gas undertaking, but would be treated as though it was the Company's own work. It might be, taking the general accounts, that in some years the item of repairs needed adjustment.

Mr. TYLDESLEY JONES: If the Arbitrator is trying to ascertain the value of the undertaking on May 1, 1915, is it your suggestion that it would be fair to take as a typical year the year 1913 (a pre-war year) and capitalize that?

Witness: I think you must take the last normal working; but, of course, he will have in his mind the fact that the undertaking is affected by the war, and may be affected for some period yet by it, and that the payment is made under war conditions.

Do you suggest to the learned Arbitrator that in this case, in which he has to value the undertaking as on a certain day, he should put a higher figure upon the undertaking because there is a possibility that my clients will not be able to pay the purchase money immediately after the award?—Yes; I think so. It may not be within your power to pay, because you have to get the consent of the Treasury.

Mr. HONORATUS LLOYD: Perhaps it will assist matters if you will say whether your clients have got the consent of the Treasury to raise a loan.

Mr. TYLDESLEY JONES: We have got the Treasury consent to raise loans for our gas-works purposes; and we have, notwithstanding the war, borrowed a large sum, by means of which we have constructed our works. In this case, of course, we do not know what the award will be; and therefore we cannot apply.

Witness: Assuming that the Arbitrator took it into his mind that we could re-invest this money at 5 per cent., in round figures, and that the value after the war for similar investments would drop by ½ per cent., this, as a matter of simple arithmetic, would mean 2½ years' purchase. It is a question of what is likely to happen in this case. I should be afraid that you would be told by the Treasury that the matter must stand over, and that you must pay interest till a year after the war.

Mr. TYLDESLEY JONES: My proposition is going to be that, under this agreement, what is referred to the Arbitrator is to assess the value of the undertaking; and the question whether we pay to-day or to-morrow under the other clauses of the agreement, is not a matter which can be taken into account or is relevant.

Second Day.

Mr. *Cash*, re-examined by Mr. HONORATUS LLOYD, said the price charged for gas was not unreasonably high, having regard to the size of the undertaking. Here, there was no statutory limitation at all; it was merely a matter of commerce. In spite of war conditions, and so on, this undertaking had not raised the price of gas. In fact, in the year taken, the charge had actually been reduced. There was a great increase in the prepayment meter supplies; but as the Company did not provide fittings, or anything of the kind, this merely meant that they were getting a large demand, with payment in advance. In other words, they were getting all the advantages of the prepayment system without the disadvantages which usually accompanied it. If it was urged that the figures of profit on the working were abnormal, it must be remembered that this was an abnormal case, because of the way in which the concern was being carried on as part of the larger undertaking. It could therefore be carried on more profitably than if it had been an entirely separate concern. But, as a matter of fact, though the results were very good, they were by no means unprecedented. The case was not abnormal when compared with some of the smaller companies which had been considered good enough to be purchased.

ENGINEERING EVIDENCE.

Mr. *Henry Woodall*, in answer to Mr. HONORATUS LLOYD, said he had inspected the works, and made himself acquainted with the history of the Company and the position of the undertaking. No attempt apparently had been made to push the concern as a gas undertaking. He thought, generally speaking, they had given a supply when asked for, but they had not tried to push it. This was shown very largely by the fact that they had not supplied many stoves. This was a matter which had to be borne in mind, because where one found a business like this actually growing without any pushing, it tended to show what could be done with the concern if it were taken up as a separate undertaking. In this case, there were only 978 houses supplied, and there were 1437 without a supply. These other possible consumers were fairly near together. He believed the mains were arranged practically to supply them all. Originally, the works were put up to supply the needs of the Company themselves; and the people then asked for a supply.

Mr. TYLDESLEY JONES: I am going to admit at once that the Company have been asked from time to time to extend their mains; and they have complied. I have no complaint of any kind against the Company in supplying gas to Ellesmere Port.

Examination continued: There was very great room for extension here, no doubt. Having regard to all the circumstances, the price charged for gas was not unreasonable. The growth of the business had been very rapid. The sale of gas in 1904 was 7,890,000 cubic feet; and in 1913 it was 24,805,000 cubic feet. The increase in consumption in the nine years had amounted to 214 per cent.; and the compound increases per annum, to 13·57 per cent. The heavy increases had been since 1908. The private consumption had grown very much more rapidly than that of the Company. The war had, of course, affected the business to some extent. That the Local Authority had faith in the outlook seemed to be shown by their action in regard to their Act, in which they made provision for a considerable increase in the future. He understood that the works which had been built were capable of turning out something like 53 million cubic feet per annum, which was about double the maximum output up to date. The Act was passed just before the war; but the works had been built since. Though there was no doubt the earning capacity of the Company's works would have increased in years to come, he had in his valuation made no claim for the prospective value. All he did was to ask to be repaid for the works which were in excess of present requirements. He had taken the year 1913, as the last one unaffected by the war; and the profit was £1812. To this he added profit on gas used by the Company £379, and extra profit on ammoniacal liquor £72; and he deducted deficiency on amount spent on repairs and maintenance (1·51d. per 1000 cubic feet) £156, stove depreciation (5 per cent. on new value of £457) £23, and superannuation £6. This left the maintainable revenue at £2078, which he multiplied by 22¼ years' purchase, making £46,235. Adding to this 10 per cent. for compulsory purchase, gave a figure of £50,858. The further additions were: Surplus works, £1898; for severance, £1800; capital expenditure since 1913, £535. Then a deduction of £200 for the land gave a total of £54,891. To get at the real value of the undertaking, it was necessary to add the profit on the gas used by the Company. Later on they would be consumers of the Council. The addition for ammoniacal liquor was made because the sum actually received in 1913 was nothing approaching a fair average. The repairs charged in 1913 came to 2d. per 1000 cubic feet, which was very low indeed. He thought therefore it would be fairer to take four years and divide by the total gas sold during that period. The result was 3·51d. per 1000 cubic feet. Adding roughly 0·25d. for stove depreciation, gave a total of 3·76d. per 1000 cubic feet for repairs and maintenance. In the circumstances of the case, he thought this was sufficient. At all events, it was what had been spent; and it was supported by the expenditure that the London and North-Western Railway made under similar headings in connection with their two other gas undertakings. It was, of course, a distinctly low figure; but he regarded it as sufficient, taking all circumstances into account. In arriving at his valuation of the surplus works, he had thought it fairer to take the average of the maximum week, rather than the maximum day. In the case the retorts, retort-house, purifiers, and gasholders, there was a margin; and there was a slight deficiency in the condenser and foul main, Livesey washer, and station-meter.

Cross-examined, witness said he inspected the works in 1913; and they were fairly well conducted then. He would not say they were getting the best they possibly could out of them. Of course, he only went there for the purpose of making a valuation for the sale of the works. The Company did not consult him in any way as to the conduct of the works. In 1913, there was a reduction in charge as regarded the private consumers, and a much bigger one for the prepayment meter users; but the increased sales were certainly not entirely due to this. He would not describe the works as having plenty of spare room; they were rather congested so far as area was concerned. He had made a structural valuation of the works; and he put the property at the works and on the Company's premises (services and meters for their own supply) at £10,693. The property outside the Company's premises he valued at £5847. The £10,693 was the sum for which he reckoned that he could re-erect the works. He had not taken them as having depreciated. The same applied to the mains. The things were in good condition, and just as useful as if they were new. The length of mains was nearly 9 miles, and the number of consumers 968. For a works of the size, this was not a very low proportion of consumers per mile of main. The public lighting was often charged in these small undertakings at the same price as the ordinary consumers. If they could sell gas cheaper in the future, they would do so.

The ARBITRATOR: And if there is a reduction to the ordinary consumer, there will be a reduction to the Local Authority?

Witness: Yes.

Mr. TYLDESLEY JONES: If you had remained in possession of the undertaking, is it your view that the price for public lighting for the future would have remained at 3s. 6d.?

Witness: No.

Cross-examination continued: He had calculated the supply of gas to the Company's own premises at 3s. 6d. per 1000 cubic feet, and deducted 20 per cent. for the bulk supply, making the charge 2s. 9·6d. This was a reasonable figure. In the Model Bill they were not allowed to take off more than 20 per cent. No doubt if a larger sum had been spent on repairs and maintenance, there would have been a larger revenue. The sum actually charged was sufficient if they were content to earn the same revenue. Many gas companies spent 1s., and some 1s. 2d. per 1000 cubic feet, which really meant that they were building new works out of revenue. This he was not allowing for. The hypothetical figure for ammoniacal liquor was put in because there was a leak in the storage tank.

Mr. TYLDESLEY JONES: Supposing the concern was subject to the competition of another gas undertaking, would this affect the number of years' purchase?

Witness: It would reduce it.

Cross-examination continued: With reference to severance, he was claiming ten years' purchase of parts of salaries and other expenses, chiefly of people who were termed the higher officials. It seemed to him this was a very reasonable figure to take. He had never claimed such a thing before; but as a rule these officials went over to the purchasing body. There were, he thought, eight persons concerned.

Third Day.

Mr. *Woodall*, re-examined by Mr. HONORATUS LLOYD, said his view was that in future the price of gas would be lowered to everybody, public lamps as well as private consumers; but the present moment was distinctly not the time to reduce the price of gas, when the cost of all materials was so high. If the private lighting was kept at the existing price, it was not unreasonable the public lighting should be.

Mr. *E. H. Stevenson*, questioned by Mr. PADDON, stated that he had inspected the Company's works and accounts, and agreed with them that the circumstances made the position of the undertaking very exceptional indeed. While the Company, under the London and North-Western Railway Act of 1893, had certain parliamentary powers to sell gas and recover the money, they were exempt from all the obligations imposed by the 1871 Act on ordinary gas undertakings. This placed a special value on the concern. The owners had an absolutely free hand in every respect. There were five settings of retorts; and the

quantity of gas required at present could be easily made with three settings such as there were there. The washer was the only item which was materially deficient on the works. The buildings were suitable for their purpose. The works had grown up bit by bit. Sufficient protection had been given to the different portions of the apparatus. Some parts were of wood, and some of corrugated iron; but this was fairly common with these small works. They were perfectly adequate for the maintenance of the income. In the course of his inquiries, he did not encounter any complaint on the score of price, quantity, or quality of the gas.

Mr. TYLDESLEY JONES: I am not making any complaint.

Mr. PADDON: Not as to price?

Mr. TYLDESLEY JONES: Only as regards public lighting. I accept the evidence Mr. Woodall gave, that this is priced a little above some other places in Cheshire.

Witness: I consider the price for public lighting is not unreasonable at all. The public lighting is not a very profitable undertaking. There are many cases where they charge the same price for public lighting as for ordinary consumers.

In further examination, witness said for his valuation the first figure he took was £1812, the profit for 1913. To the gas supplied by the Company to themselves at cost price, he added a proper margin of profit. In other words, he took it as a bulk supply, and gave a discount of 15 per cent., and a further 5 per cent. for cash. The total figure was £967; and deducting the sum actually received, £387 was the amount which should be added to the standard year. Then there was £57 on account of ammoniacal liquor. The total was £2257. As to deductions, the first was in the matter of repairs. He put down 1·51d. per 1000 cubic feet, or £156. A Company like this had a great advantage in the matter of both material and labour. The works were in quite good order, and thoroughly well able to earn the profit, year in and year out. In his opinion, 3½d. per 1000 cubic feet was sufficient to maintain the undertaking in a condition to continue earning the profit. He had added £20 for depreciation of stoves, and £6 for superannuation. Therefore he deducted £182 from the £2257, giving a maintainable profit of £2075, or exactly 20d. per 1000 cubic feet of gas sold. There were plenty of cases in which this profit was earned, and not considered at all abnormal; and he did not consider it was abnormal here. For the multiplier he had taken the 4½ per cent. table, which gave 22¼ years' purchase. With 5 per cent. for compulsory purchase, his figure came to £48,477. For the excess plant, he put down £2095; and the £180, at ten years' purchase, for severance, made £1800. This question of compensation for salaries was an adaptation of quite ordinary principles to this particular case. Allowing for capital expenditure and the value of the land, his final valuation came out at £52,707. He did not make any allowances for the small deficiencies on the works, because they were all discounted in the accounts. If the deficiencies were made up, the profits would be much larger, and they would be asking a considerably larger additional sum than the capital required for making up these deficiencies. The works as they stood were equal to maintaining the income.

In cross-examination, witness said that so far as he could see the works were quite decently managed. In arriving at a fair amount to charge for a bulk supply, he never calculated what the cost of the gas was to him. There were a great many things to take into consideration besides just the cost; and if one only reckoned the cost which was saved to the undertaking, it would not be worth while people taking a bulk supply and finding the capital. His total allowance for repairs and maintenance was 3·7d. per 1000 cubic feet; but he doubted if he could split up the items. It was an abnormally small amount, because of the abnormal undertaking; and therefore he could not split it up. He would think 1d. was rather high to put on the mains; but he would not dispute it. As to whether the mains were small, the pressures were ample; and as the pressure at the works was not excessive, it showed that the mains were sufficient for the profit. Perhaps one-quarter of them might have to be replaced when the consumption had doubled; but for the present there was no reason at all for them being enlarged. The difference between his valuation for excess plant and Mr. Woodall's, was that he had taken a proportion of the coal storage, and Mr. Woodall had not. He had not made any calculation of what the rateable value of an undertaking earning this profit ought to be; but he had compared it, and found the amount per 1000 cubic feet of gas was quite as much as others, and more.

Mr. TYLDESLEY JONES: You have not attempted to make a valuation of the undertaking for the supply of gas to the public as apart from the manufacture and supply of gas to the Company's own premises, or of the works necessary to give the supply?

Witness: Certainly not.

Could you assist me at all to value the public supply only?—You mean and leave us with our own supply—buying a portion of the undertaking?

Yes?—You cannot do that, because you have to buy the whole undertaking under the agreement.

That is a question upon which I am not going to ask an engineer to express an opinion?—No; the agreement speaks for itself.

Mr. HONORATUS LLOYD (in re-examination): We know the history of this undertaking. It was originally an undertaking to supply ourselves; and at the request of the public we supplied them in addition. Now it is suggested that we should sell the addition and keep the undertaking?

Witness: Yes; and have works much larger than we want, and therefore have to supply ourselves at an enormously enhanced price.

Do I understand you to say, in your experience, with companies such as this, the amount we paid in respect of rates is by no means unreasonable?—No. It is not unusual either.

LOCAL EVIDENCE.

Mr. *H. P. Beckett*, an architect and estate agent of Ellesmere Port, valued the sites of the gasholders and works at £169 2s. 6d.

Witness was cross-examined at considerable length as to the prices at which other pieces of land in the neighbourhood had been disposed of.

Mr. *Levy Lindop*, a mechanic employed in the Shropshire Union Company's engineering department, stated that he had acted as superintendent over the foreman and the leading hands now in the gas-works. The foreman, William Nicholas, had now gone to another gas-works. It was not true that the whole of the foreman's time, or anything like the bulk of his time, was occupied in the gas-works. The head stoker's time was given up to the gas-works; but otherwise all the supervision was exercised by the representatives of the Company in among their other business. The mains were laid at a depth of 2 ft. 6 in. In recent times there had been several breakages, which he put down to the heavy traffic—steam-waggons and trailers. He had never known any canvassing for customers to be done. Gas had simply been given to anybody who asked for it. For the public lighting, the Company were supposed to supply gas to lamps which consumed 4½ cubic feet an hour. As a matter of fact, tests which had been taken by Nicholas showed that they were burning considerably more than this—in one case 5·7 feet per hour.

Fourth Day.

Mr. *Lindop*, in cross-examination, said he was responsible for the gas undertaking, and gave perhaps one-tenth of his time to it. His salary was £250 per annum. Nicholas at the time he left was in receipt of £138 per annum. Superintending mains and repairs was included in the one-tenth of witness's time. Nicholas would spend about an hour a day at the gas-works. The only men who devoted the whole of their time to the gas-works were six stokers. There was, of course, some clerical work involved. He was a member of the District Council, who had got an Electric Lighting Order. On one or two occasions they had been troubled with deposition of naphthalene in the station-meter. Special castings for the works were made in the Company's foundry.

Mr. *William Whittam*, Manager of the Shropshire Union Company, examined by Mr. HONORATUS LLOYD, stated that in 1912 there was a public meeting, and a request was made to the Company to lower the price of gas, and the following year the price was reduced. He had had no complaints with reference to the undertaking. Had the business been pushed, they could have shown a very different result. The Company could not re-invest any money they were awarded in similar gas-works. In fact, he could not see his way to investing the money so as to return more than 4½ per cent.

Cross-examined: The Company had loans of their own to get rid of, before they thought of investing any money they might get in War Loan.

Mr. TYLDESLEY JONES: Have you personally made any apportionments of time to the gas-works?

Witness: No; they have been made under my direction. I know the work that has to be done, and it is spread over so many. It is difficult to apportion; but it has been done, I believe, reasonably.

I am not suggesting that you have not done your best; but it is difficult to apportion. It has only been done for the purposes of this arbitration, quite *bonâ fide*?—Yes; we have not the slightest need to keep records of how much time it took a clerk to receipt a bill for 15s., or anything of that kind.

The ARBITRATOR: Have you formed any opinion in your own mind as to what would be done by the Company with the site which will shortly be vacated and put on their hands?

Witness: No; there has been no decision arrived at in any way, nor any proposals or suggestions made. It is obvious from the position of the land, without any access, that it can be used for very little. Nothing whatever can be done with it without the expenditure of a very large sum of money.

Mr. *Cash* was recalled to give the results of a close inquiry into the question of the officials whose services will be set free from the gas-works when the transfer takes place. He said from this it looked as though, if the men stopped on, the ten years' capitalization was well within the mark. The finding of fresh employment for the officials would be a gradual process.

This concluded the Company's case, except for the apportionment of an amount for capital expenditure from 1913 to April 30 last.

Use More Gas and Less Coal.—In their issue of last Thursday, the "Daily Chronicle" remarked that mistresses who are burning gas instead of coal find that patriotism in this direction certainly pays when the problem of getting servants arises. On the previous day, they were informed by an official of a gas company that already hundreds of orders had been received for gas-fires as a result of the appeal recently appearing in the newspapers.

Cleveland Water Company.—The Cleveland Water Company's half-yearly report shows that, after meeting the expenditure, there remained a balance on the last six months' working of £5033. The Directors recommend that £3400 be employed in the payment of dividends at the rate of 10 per cent. per annum on the original and "A" shares, and at the rate of 7 per cent. per annum on the "B" shares, and that £1633 shall be carried forward to next half year's account. The Directors regret to report the death of Mr. W. I'Anson, who had been Engineer and Secretary since the beginning of the Company 46 years ago. They announce the appointment of Mr. William M. I'Anson, the Assistant Engineer for 22 years, as Engineer, and of Mr. W. J. Deighton, for 40 years in the service of the Company, as Secretary.

Wages Dispute at Stourbridge.—It was reported at a meeting of the Stourbridge Town Council last Wednesday that a number of employees at the gas-works had threatened to strike. On the 10th inst. letters were received from Mr. J. C. Mason (Secretary of the Amalgamated Society of Gas, Municipal, and General Workers) enclosing notices from the men to terminate their employment at the expiration of 21 days from Jan. 6; the reason presumably being that the advances in wages recently granted by the Council were not considered satisfactory. It was decided that Mr. Mason be informed that his demands would not be conceded; that each man be allowed to withdraw his notice up to mid-day last Friday, after which time his place will be filled; and that the Manager be instructed to take such steps as may be necessary to fill permanently the places of any men who leave.

GAS AND ELECTRICITY SUPPLY TO A SHELL FACTORY.

The Newport (Mon.) Gas Company and the Corporation Electricity Department.

The Newport Gas Company and the Corporation Electricity Department have recently been before the Board of Trade in connection with a proposal to supply with electricity a national shell factory situated outside the borough boundary of Newport, and outside the limits of supply of the Electricity Department. It appears that there is no need whatever for the supply of electrical energy for power to these works, as there is already installed there a supply of gas; and the trunk main leading to the entrance of the works is 12 inches in diameter. The Gas Company were never even asked to tender for the supply of the works, though the Company are already supplying gas to a large shell factory in Newport, both for lighting the premises throughout and for the lacquering of shells.

An agreement was made between the Committee of Management and the Electricity Department of the Corporation of Newport, for the supply of electric current to the factory. The Secretary to the Committee of Management is the Chairman of the Corporation Electricity Department. No information was afforded to the public with respect to this agreement until it was brought up for approval at a private meeting of the Council on Dec. 23 last; and on Dec. 24 the necessary plant was ordered. The Gas Company at once took steps to bring the matter before the Board of Trade.

The Board decided to hear the Gas Company in opposition to the application of the Corporation for permission to lay a cable beyond the borough boundary to the works. The inquiry lasted a considerable time; evidence being given on the side of the Corporation by Mr. J. Moxon (Chairman of the Committee), also by a member of the Committee of Management, and by Mr. Nichols Moore, the Corporation Electrical Engineer. The Gas Company were represented by their Solicitor, Mr. Wilson, of the firm of Messrs. Davis, Lloyd, and Wilson, of Newport. The evidence on the side of the Gas Company was given for the most part by their Engineer (Mr. Thomas Canning); but there were also present at the inquiry, ready to give evidence if required, the Secretary of the Company (Mr. T. H. Hazell), the Deputy-Chairman (Mr. Cartwright), and some members of the Board. There were also present Mr. Goodenough and Mr. Mason, on behalf of the British Commercial Gas Association; and their advice and assistance were of great advantage.

The Board of Trade finally consented to grant the Order to the Corporation, limiting it to the shell factory; and it is only to remain in force for such time as the premises shall be used by the Government as a shell factory. This is a very important qualification, which perfectly justifies the Gas Company having made their appeal to the Board of Trade.

USE OF GAS IN WAR TIME.

The Good Work of Apparatus Makers.

At the Annual General Meeting of the Midland Association of Local Government Officers, held last Wednesday at the Exchange Hotel, Birmingham—the President, Mr. H. E. Stilgoe, City Engineer and Surveyor, in the chair—a lecture entitled "Gas Aid in War Time" was delivered by Mr. R. J. Rogers, Assistant Fittings Superintendent to the Birmingham Corporation Gas Department. The meeting was well attended. A similar lecture was delivered by Mr. Rogers on Friday, at the Smethwick Technical School.

In the course of his lecture, Mr. Rogers stated that there were very few industries in this country that had not been affected in some degree by the war; and though in many directions there had been delays—some inevitable and some otherwise—it had been truly remarkable to see the ready manner in which certain industries had responded to the new order of things, and reorganized their business to meet the changed conditions. The gas industry, in common with others, had had great responsibilities placed upon it, not only in supplying gas for industrial purposes in munition factories, but in providing the essential products for the manufacture of high explosives. It had doubtless come as a surprise to many people to hear that extractions from coal gas played such an important part as raw material in the production of high explosives.

A large amount of notice had been attracted to the articles in the daily Press during the last few days, as to the extended use of gas for all purposes, which had been advocated by the Ministry of Munitions, in order that the supply of toluol and benzol should not be restricted. It was of the utmost importance that gas should be used to the greatest manufacturing capacity of the various gas-works in the country. The output of gas by different gas undertakings varied largely according to the geographical position of the undertaking. While the consumption in some areas had been low during the war, the demands on other gas-works—particularly those in munition areas—had been very great and embarrassing. Birmingham was not the only gas undertaking which had been compelled to ask consumers to economize in their use of gas for domestic purposes. The demands in Birmingham for gas for use in munition factories had been so great that it was necessary that for the moment the strictest economy should be exercised.

He referred to the recent report issued by the Special Committee appointed by the Ministry of Munitions, on "industrial canteens," and said it was gratifying to know that in most of the large munition works in Birmingham arrangements had been made for providing work-peoples' dining-rooms; and in this direction gas-heated appliances for warming dinners, cooking food, providing hot water for teas, &c., had been installed on a large scale. By means of lantern slides, the lecturer fully explained how gas was helping in the manufacture of

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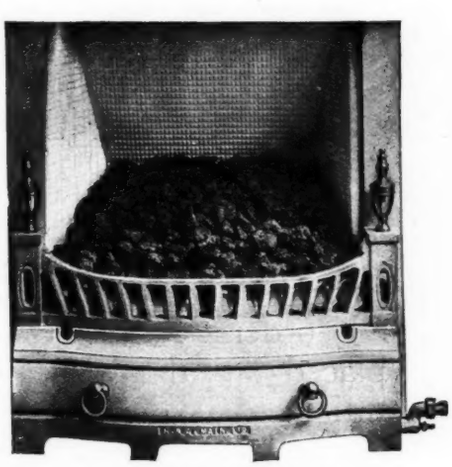

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munitions, from service cartridges to 15-inch shells, in the manufacture of transport motors, in the equipment of the army, the making of boots, caps, and clothing, in cooking for men in barracks, and for providing the cooking and heating arrangements in hospitals, operating theatres, &c.

In conclusion, Mr. Rogers stated that due credit should be given to the large gas apparatus manufacturers in the country for the way in which they had dealt with the extraordinary needs of the munition makers. To a great extent, munition manufacturers were indebted to the speedy manner in which the apparatus makers designed the necessary furnaces for dealing with the manufacture of shells. A good deal of experimental work had been necessary before the apparatus could be constructed; and the fact that they had been able to "deliver the goods" in such a short time bore testimony to the excellent organization of the makers of gas-heated furnaces in this country.

KENSINGTON BOROUGH COUNCIL AND GAS-TESTING.

The Works Committee of the Kensington Borough Council have again had under consideration the letter received from the Ministry of Munitions on the subject of the notice given by them to the Gas Light and Coke Company requiring the extraction of certain constituents from the Company's gas which may somewhat affect the illuminating and calorific standard imposed by law, together with the terms of the report which they submitted at a previous meeting of the Council, and which was withdrawn after some little discussion.

The Committee now report that they feel it to be only due to themselves to point out that, in the earlier report, no exception whatever was taken to the requirements which the Ministry of Munitions had made upon the Gas Light and Coke Company. Continuing, the Committee say: "Nothing could be further from our wish than that any obstacle or difficulty should be raised to the Government obtaining from the Company any of the bye-products of their gas which might be of service in the prosecution of the war. What we thought the Council should dissent from were the suggestions put forward in the letter from the Ministry that the testing of the gas supplied by the Company should cease, or that if the tests were continued the results of the tests should not be allowed to be made known to the public; and we still adhere to the view that no good purpose is likely to be served by these suggestions being acted upon, and that the public are entitled to know the quality of the gas with which they are being supplied, even if the standard of that quality may be lowered. The Company can in a very great measure, by a process of artificial enrichment, make good any loss of illuminating and calorific power occasioned by the withdrawal from their gas of the constituents which the Government are requiring; and we fail to see that any cause is shown for depriving the gas consumers in the Metropolis of their safeguards as regards the quality of gas supplied to them, or for removing all checks or control upon the Gas Company. We recommend (*a*) that a communication be addressed to the London County Council intimating that this Council are in no way desirous of hampering the Gas Light and Coke Company in any action which they may be taking for the assistance of the Government, but they are not able to agree with the suggestions which have been put forward in favour of the cessation of the testing of the gas or the non-publication of the results; and (*b*) that, in the event of the above recommendation being adopted, the views of the Council on the matter be communicated to other Metropolitan Borough Councils for their information."

JOINT-STOCK COMPANIES' RETURN.

The Twenty-Fourth Annual Report by the Board of Trade on matters within the Companies Acts, 1908 and 1913, contains the usual list of companies dissolved or struck off the register during the period dealt with—the year ended Dec. 31, 1914. This includes the following companies, some of which, of course, may have since been re-incorporated, under the same or a similar name.

Aberford Gas Company, Bedlington Gaslight Company, Bishop's Castle Gaslight and Coke Company, Bishop's Waltham Water-Works Company, Blakeney Gaslight and Coke Company, Boughton Blean Gas and Coke Company, Bridge of Earn Gaslight Company, Cavan Gaslight Company, Chinley Gas Company, Condal Water Company, Donaghadee Gaslight Company, Great Coggeshall Gas Company, Kingswood Water Company, Kirriemuir Gas Company, Lanark Gas Consumers' Company, Lisburn Gas Company, Narberth Gas, Coke, and Coal Company, North Oxfordshire Water Company, Penkridge Gas Company, Robertsbridge, Salehurst, and Hurst Green Water and Gas Company, Stanford-le-Hope Gas Company, Theale Gas Company.

Daylight Incandescent Mantle Company, Foreign and Colonial Lighting Company, Gas, Water, Finance, and Contract Company, Golden Gleam Mantle Syndicate, Heat, Light, and Power Syndicate, London Gas-Mantle Manufacturers, M.H. (Methane Hydrogen) Gas Plant, Matchless Self-Lighting Mantle Syndicate, Merlin Gas and Engineering Company, Morton Gas Syndicate, New Sunbeam Acetylene Gas Company, Non-Explosive Gas Company, Notkin Light and Power Company, Petrolite, Limited, Platico Mantle Company, Robin Gas-Mantle Works, Star Incandescent Light Company, Tourtel Gas and General Engineering Company, Universal Water-Meter Company, Westminster Gas Compressors.

District Electric Company, Electric Ignition Company, Electricity Generating Company, Electric Power Plants, Harrington Electric Light Company, Leicestershire and Warwickshire Electric Power Syndicate, Madeira Electric Lighting Company, Mutual Electricity Company, Preston Electric Company, Provincial Electrical Company.

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THE JARROW RAILWAY ACCIDENT.

Gas Lighting in Trains.

The Board of Trade inquiry in connection with the fatal railway accident which occurred near Jarrow on Dec. 17, was resumed and concluded by Colonel Von Donop at Newcastle last Thursday. The earlier proceedings were referred to in the issue of the "JOURNAL" for Dec. 28, p. 720.

One of the drivers, who gave evidence at the previous hearing, was recalled, and in answer to the Inspector said the first outbreak of fire he saw was from a gas-jet.

The Acting Chief Engineer of the Railway Company (Mr. A. C. Stamer) stated that the pressure in the gas-cylinders of the two leading vehicles of the up passenger train was about 75 lbs. per square inch. In the leading coach of the empty train, the pressure would be about 20 or 25 lbs. per square inch. The Company had gone into the question of strengthening the ends of the cylinders, and whether cylinders could be housed more safely. They had gone further, and had built a dining-car, and housed the cylinders well up in the frame, and reduced the diameter of them. The question of using non-inflammable wood in the construction of the carriages was considered; but owing to the war, there was not time to go further into the matter, which would involve a good deal of expense. At the same time, they experimented with some all-steel carriages. The electrical stock running on Tyneside had had non-inflammable floors from the commencement. The Company had fitted 344 coaches with electric light, exclusive of those on Tyneside. During the last three years, all passenger-carrying vehicles built by them had been fitted with electric light. The vehicles to be built this year would also be so fitted. The figures he had given related purely to North-Eastern Railway stock, and did not include the vehicles of the East Coast joint service. A large majority of the latter were also fitted with electric light, and the same applied to the North-Eastern and Great Northern joint stock.

SCOTTISH FARMERS AND SULPHATE OF AMMONIA.

A Deputation in London.

Reference was made in "Notes from Scotland" last week to the difficulty which Scottish farmers are stated to be experiencing in securing supplies of fertilizers on terms that commend themselves to the users. The matter formed the subject of a deputation of agriculturists to the Scottish Office, in Whitehall, on Thursday. The delegates asked that immediate relief should be afforded in the matter of railway transit, and that there should be made available the full home output of sulphate of ammonia for fertilizing purposes. This, it was urged, had become necessary owing to the impossibility of securing supplies of nitrogenous fertilizers from South America.

Mr. F. D. ACLAND (Parliamentary Secretary to the Board of Agriculture), in his reply, said the Board had tried to popularize the use of sulphate of ammonia; and they had asked the makers to reduce the price on the understanding that the Board, in cases where it would pay, would induce farmers to use sulphate. It was not, however, easy to go to the producers and ask them to reduce prices for the ordinary spring trade. The Government could secure supplies; but they could not anything like so easily fix prices. Whether the suspension of licences for export would have any effect on prices might be open to consideration. Even if the issue of licences was suspended for some time, it could not be suspended altogether. He asked Scottish farmers, where possible, to take advantage of buying the sulphate without waiting for the price to come down. As to nitrate of soda, it was known that the Government had bought a considerable quantity in order to ensure ample supplies. Since the purchase, freights had got quite extraordinarily worse. It might still be possible to get nitrates over in time for this season; but he advised farmers not to make any arrangements on this basis. He saw no prospect of the freight difficulty getting better—on the contrary, he thought it was going to get worse. There was a good deal of nitrate of soda in the country; and the demand for munition purposes was considerable. For such purposes, higher prices were offered than the farmers would care to give.

Mr. M'KINNON WOOD (Secretary for Scotland) pointed out that it was inevitable that transport facilities should be inadequate for all needs in time of war. He would suggest that, where difficulties were acute, the Department should be informed; and then, in association with the railway companies, powers would be secured so as to meet deficiencies.

HOBART ELECTRICITY SUPPLY.

The Gas Company's Undertaking.

A Select Committee has been inquiring into a Bill having for its object the carrying into effect of an agreement between the Directors and the Minister of Lands and Works for Tasmania for the acquisition of the electrical undertaking of the Hobart Gas Company; and a report by them has been presented to the House of Assembly.

The Committee, in the course of their report, state that evidence was procured from independent experts and all parties interested in the measure, who dealt with the questions involved from their various aspects. While giving every attention to what was submitted, the Committee paid particular attention to the financial side—the price which the State are asked to pay the Hobart Gas Company for their electrical undertaking, the reasonableness or otherwise of this price, the amount of revenue likely to accrue to the State as a result of the contemplated

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purchase, and also the legal position of the State as between the Hobart Town Gas Company, the State itself, and the right reserved to the Hobart Corporation under an Act to authorize the Hobart Town Gas Company to light the City of Hobart and the suburbs by electricity, which was passed in 1895.

The conclusions arrived at by them are: (1) That if the Bill is not passed, there will be three authorities in Hobart with the right to supply electric power—namely, the Hobart Corporation, the Hobart Town Gas Company, and the State—thus causing confusion and complication. (2) That under ordinary circumstances the lighting of the City of Hobart should be undertaken by the Corporation; but as the State Hydro-Electric Department may have to depend upon the consumption of electricity in Hobart and suburbs for its revenue for the first few years of its operations, there is little chance of the department materially expanding those operations under the present system of triple supply. There is, however, scope for considerable expansion of business in Hobart if the State becomes the sole supplier. The undertaking, as provided for in the Bill, is, the Committee believe, a sound financial proposition for the State. (3) That it is in the best interests of the State that the Bill should pass, with slight amendments.

The Committee direct attention to section 35 of the Hobart Town Gas Company's Electric Lighting Act, which provides that all profits made by the Company over 12 per cent. per annum shall be divided between the Company and the Corporation of Hobart, and recommend an amendment of the Bill, to protect the rights conferred upon the Corporation of Hobart by the Act. The Committee further recommend that a clause be inserted in the Bill to remove any doubts as to the power of the Hobart Town Gas Company to distribute money, &c., received in connection with the sale of their electric light property to the State, as provided for by the Bill.

The report was received; and it was ordered that the Bill be taken into consideration.

The official transfer to the Government of the Gas Company's electrical plant took place on Dec. 7.

South Metropolitan Gas Bill.—The General Purposes Committee of the Lambeth Borough Council have reported that they have examined the South Metropolitan Gas Bill, from which it appeared that the provisions of the Bill were all financial. They did not seem to affect the Council in any way, save that it was not expressly stated that the new stock which the Bill was to empower the Company to issue was to be, as regards dividends, on a sliding-scale, varying with the price of gas. The stock would probably be held to be entitled to dividends only in accordance with such scale; but in order that the point might be placed beyond doubt, the Town Clerk had communicated with the Company's Parliamentary Agents, with a view to some provision to this end being inserted in the Bill. This course they were willing to adopt. The Council approved the action taken by the Committee.

NOTES FROM SCOTLAND.

Lighting of Edinburgh Streets.—On Friday last, the Lord Provost of Edinburgh, the Commander of the Coast Defences, and the Conveners of the Electric Lighting and Cleaning and Lighting Committees, with the officials, met to consider the question of the public lighting of the city. It was decided, on the advice of the military authorities, to continue the present regulations. This means that practically the whole of the gas-lamps will remain unlit—the reason being that, in the event of an air-raid, some hours would be occupied in extinguishing the lamps if they were in use.

New Edinburgh Electric Power Station.—The question of the new electric station to be erected at Portobello (a suburb of Edinburgh) came before the Edinburgh Town Council last Tuesday. The cost of the works, for which tenders had been accepted, was £93,369; and the estimated cost of the remainder of the work was £106,215—a total of £199,584. A report from the Electric Lighting Committee recommended general approval of the plans and elevation of the station, and asked for a remit to obtain and submit estimates for carrying out the work. The report and recommendation were approved. The Edinburgh electric undertaking has made great strides in recent years, and, with energy at 2⅝d. per unit for lighting and 1⅛d. for power, is a serious competitor, in both fields, with the Gas Commissioners.

A Schoolboy Electrocuted.—A schoolboy named Walter Jamieson, of Nitshill, Renfrewshire, met with instantaneous death last week, through accidentally touching a live electric wire. He was on his way to school when he met with the accident, which arose through the wire having fallen to the ground.

Aberdeen Water Officials to Refund Gratuities.—In connection with the Aberdeen Water Bill, which is now before Parliament, a large amount of extra work has devolved upon the Water Engineer and others. The Provisional Order Sub-Committee, feeling that some recompense was due, granted gratuities of £300 to the Engineer, £150 to his Assistant, and smaller sums to other officials—in all, £513. At a meeting of the Town Council on the 17th inst., the power of the Committee to make such grants was questioned; and, after a lengthy debate, it was agreed, by 26 votes to 6, to disapprove of this action, and to request the officials to refund the sums paid to them.

Electrical Breakdown at Wigan.—There was a failure of the Wigan Corporation electricity supply last Friday evening, just at the time when trade was at its highest, and when the houses of entertainment were in full swing. There had been much uncertainty about the supply all day; and the tramway service was suspended. It seems that the steam-raising capacity of the plant at the generating station is sufficient; the contractors being unable, owing to the war, to deliver new boilers which it was anticipated would have been supplied and in use by last Christmas.

The "MARS" Gas Heated Steam Radiators.

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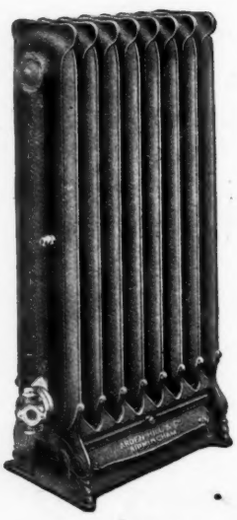


The "MARS."

WHAT MAKES THEM SO DURABLE: The Radiator Loops are assembled with malleable nipples and metal-to metal joints — making the life of Radiator uniform and absolutely lasting in character.

AUTOMATIC VALVE: Free from mechanism; simplicity itself; and infallibility as well.

MAINTENANCE: The cost ot upkeep is practically ***nil.***

These Radiators are quickly and cheaply installed and as easily removed, and are therefore specially suitable for heating temporary buildings.

ON HIRE WITH MANY IMPORTANT GAS UNDERTAKINGS.

ARDEN HILL & CO.,
Acme Works, Birmingham.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 24.

Tar products are generally unchanged in price. Pitch, which is still quoted at 19s. to 19s. 6d. net, is, of course, largely governed by the freight situation, and it appears likely that freights have been carried too high recently, and that a recoil may be anticipated. Solvent naphthas are in large demand; while naphthalene in any form is almost unobtainable. Creosote remains at 4⅛d. to 4¼d. net in bulk at makers' works.

Sulphate of ammonia is firm at £17 5s. net per ton, filled into buyers' bags at makers' works for 25 per cent. quality for January-June delivery.

Tar Products in the Provinces.

Jan. 24.

The markets for tar products remain about the same. One or two sales are reported in pitch, but not of much importance. After making allowances for the freight, the price works out at the equivalent of to-day's quotations. Creosote continues quiet, and is still being offered in large quantities. Heavy and solvent naphthas are in very good demand.

The average values of gas-works products during the past week were: Gas-works coal tar, 18s. 6d. to 22s. 6d. Pitch, East Coast, 15s. to 16s. per ton; West Coast, 15s. to 15s. 6d. Manchester; 16s. to 16s. 6d. Liverpool; 17s. to 18s. Clyde. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 7d. Solvent naphtha, naked, North, 2s. 1d. to 2s. 2d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2⅞d. to 2⅞d. Heavy oils, in bulk, 3⅝d. to 4d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene, £18 to £28; salts, 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Jan.* 22.

Owing to the unsettled conditions prevailing in this trade, the market has been inactive throughout the week, and prices have receded a little below the highest points recently attained. The nearest values at the close are £17 13s. 9d. per ton f.o.b. Hull, £17 17s. 6d. f.o.b. Liverpool, and £18 1s. 3d. f.o.b. Leith for delivery this or next month. No transactions have been reported in the forward position, and it is evident that buyers and sellers have both made up their minds to await developments before committing themselves further.

Nitrate of Soda.

The spot prices of this material have advanced further, and the quotations are now 16s. 6d. per cwt. for ordinary quality, and 17s. 6d. for refined.

Sulphate of Ammonia.

From another source, it is stated that there is nothing fresh to report concerning this article, and prices are practically the same. Outside London, makes are £17; Hull, £17 15s.; Liverpool, £17 17s. 6d.; Leith, £17 17s. 6d. to £18; Middlesbrough, £17 15s. to £17 17s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is brisk, though new regulations as to the licences for coal export are affecting some classes of fuel. In the steam coal trade, the Government appear to be taking a larger proportion of the output; and this is stiffening the market. With, therefore, limited quantities of steam coals available for a fortnight or so, the prices are naturally very firm. Best Northumbrian steams are 25s. per ton, though higher prices are sometimes asked for next month; second-class steams are somewhere near 23s.; steam smalls vary from 12s. 6d. to 15s. per ton—all f.o.b. In the gas coal trade, the demand is good, though it is now past the most pressing consumption period. Best Durham gas coal is about 22s. 6d. per ton f.o.b., second-class gas coals are near 21s. per ton; and "Wear Specials" are steady at 21s. 6d. per ton f.o.b. There is still some scarcity of gas coal for prompt delivery. Rates of freight continue high—gas coal from the Tyne to London being nominally about 15s., but much coal is being carried on freight-contracts at differing rates. The Durham miners' annual report (just issued) states that 30,000 of the members have enlisted, so that the effect on the coal production of the county is readily seen to be very great, and accounts for the relative scarcity of gas coal during the current month. Nothing is doing in contracts for gas coal just at the present time. Gas coke is steady generally, and may be quoted as 28s. 6d. to 29s. 6d. per ton f.o.b. Stocks are fairly heavy at some of the inland gas-works.

The Reason for Economy in Birmingham.—The general appeal published requesting householders to assist in the production of high explosives by burning more gas and less coal, has, says the "Birmingham Post," caused some confusion in Birmingham, where the public have repeatedly been asked to economize in the consumption of gas. In an interview, an official of the Corporation Gas Department stated that while, generally speaking, the appeal was well founded, Birmingham was peculiarly situated, owing to the tremendous demand for munition factories. The Gas Department were not anxious to encourage the use of gas for domestic purposes at present.

"BEARSCOT" SPECIALITIES

Telegrams: "Scrubber, Manchester."

"Have never failed to give Satisfaction."

R. & J. DEMPSTER, Ltd., MANCHESTER.

London Office: 165, GRESHAM HOUSE, Old Broad St., E.C.

Nottingham and Gas-Fires.

The opening by the Nottingham Corporation of new gas showrooms, in a central part of the city, for the display of up-to-date cooking and heating apparatus, has been quickly followed by a spirited newspaper correspondence locally anent the relative merits of gas and coal fires. Already, therefore, the venture may be said to have more than justified its inception, and that in a manner which could not have been contemplated specially under the original scheme of operations. A writer responsible for a column of daily newspaper "Notes by the Way" had had the temerity to suggest that "there is no gas-fire on the market as yet that will compete with the open fire in either health or comfort." But he has been subjected to some drastic criticism by a correspondent who declares emphatically in favour of gas as being healthier and far more of a comfort than the old open fire—healthier because there is no dust, and more convenient from the fact (especially important in cases of sickness) that a room can be kept at an equable temperature—an impossibility almost with a coal-fire. Manifesting practical acquaintance with the subject, the correspondent also serves a useful purpose by pointing out that the gas-fire selected should be properly fixed with a cone over the exit pipe in the chimney to stop the down-draught sending fumes into the room.

Accident to a Gas Manager.—While engaged repairing a cylinder at the Carrickmacross Gas and Electric Works, the Manager (Mr. Wm. Scotson) sustained severe injuries to the face by an explosion of gas in the cylinder.

Progress at Burslem.—At a meeting of the Burslem Municipal Association last Tuesday, Alderman T. Mitchell (the Chairman of the Stoke-on-Trent Gas Committee) read an instructive paper showing the progress of the Burslem gas undertaking since the year 1876, when it was taken over by the Local Board from the Burslem and Tunstall Gas Company at a purchase price of £80,000. The total length of mains in the area now exceeds 45 miles, and there are 8283 meters in use, of which 6227 are automatic. The total capital value had been increased to £131,416; there is a loan indebtedness of £64,068; and up to the time of federation the works had contributed £66,600 to the relief of the rates.

Holmfirth Gas Company.—The annual meeting of the Company is to be held to-morrow, when accounts will be submitted which show a profit on the year's working of £1553. The gas made, under Mr. A. E. Buckley (the Manager and Secretary), was 37,342,800 cubic feet, or an increase of 3,165,800 cubic feet over the twelve months ended Dec. 31. 1914. The increase in the make equalled 9·26 per cent., and in the quantity sold 10·2 per cent. The gas made per ton of coal carbonized was 11,385 cubic feet; and the percentage unaccounted for, 5·02. The increase in the make per ton over the preceding year (which coincides with the installing of a retort-house governor) is 385 cubic feet, which represents a saving of 115 tons of coal.

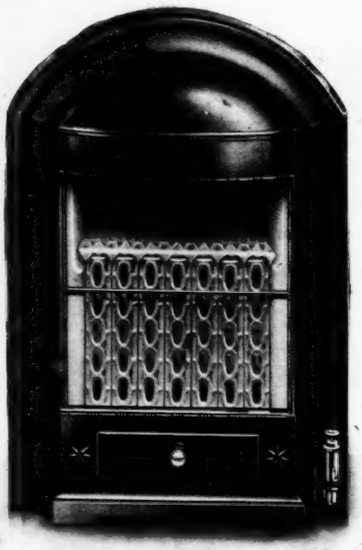
Gas Undertakings and Road Board Funds.

The "Yorkshire Observer" states that a gas engineer who occupies an advisory position in one of the Government Departments dealing with war matters writes: "Though the gas concerns, as recently announced in the Press, are generally patriotically doing their duty at a financial loss by extracting from the gas benzol and toluol, which are converted into high explosives for the defence of the country, yet there is another aspect of the situation which would materially aid them and have the effect of reducing the price of gas. The Road Board, before the war, with the funds allocated to them by the Government, kept the main roads in excellent repair. In a recent announcement in print, it appears that the usual funds at their disposal have been diverted elsewhere. Considering the bad state of repair the roads throughout the kingdom have now got into, I consider it to be very false economy that these funds have been diverted, because roadways, especially main roadways, during war time may be considered, in these days of rapid road transit, as of equal importance with railways, especially in view of the congestion on the railways for the carriage of goods and passengers. Now, to a large extent the gas concerns were the means of supplying the specially prepared tar used for the roads to keep them in a fit state of repair. This market is to a very large extent closed to the gas concerns, even though they have been induced to put up special apparatus in many cases to form the prepared tar. In the preparation of this tar the valuable constituents required for high explosives are separated and converted into explosives. The consequence is that tar now has to find its way to established distilleries, and further helps the congestion of railway traffic. Large accumulations of pitch and tar are lying at the distilleries. The general result is that the price of tar has decreased to such an extent as to impose a further loss on gas concerns. This is bound to reflect itself in the prices of gas. It cannot be said that the labour to carry out this form of repair to the roads is wanting; for it may be noted that there are plenty of men of non-military age engaged upon trimming hedges, paths, &c. They would be more usefully employed repairing the roadway itself. The Government, in the interests of true economy, should reconsider the matter."

Gas Profit at Tow Law.—At the last meeting of the Tow Law (Durham) Urban Council, the District Auditor's report was presented, showing a net profit on the gas-works during the last financial year of £290, after the Council had incurred an expenditure of £201 on new plant, &c.

Lighting of Pontardulais.—A parish meeting of the Hendy lighting area has approved of the action of the Joint Lighting Committees of Llandilo Talybont and Llanelly in terminating their contracts with the Gas Company on account of the action of the latter in raising the price by 6d. per 1000 cubic feet. The Joint Committee are also asked to take further drastic steps.

By Appointment.



No. 590 "STELLA" GAS FIRE.

"You can hear a pin drop"——

When a "Stella" Gas Fire is burning.

You can't make these Fires light back.

The heat is intense—perfectly distributed—and no apparent flame.

THESE ARE ONLY A *FEW* FEATURES OF THE

CARRON *PATENT* "Stella"

Gas Fires

FOR THE REMAINDER OF WHICH YOU ARE REFERRED TO THE COMPANY'S BOOKLET, FREE ON APPLICATION.

CARRON COMPANY *Works:* CARRON, STIRLINGSHIRE, and at Phœnix Foundry, Sheffield.

Show-Rooms: London (City and West End), Liverpool, Manchester, Bristol, Birmingham, Newcastle-on-Tyne, Edinburgh, Glasgow, Dublin.

Liverpool Public Lighting.—A meeting of the Liverpool City Council took place last Wedensday, to see whether any further reduction could be effected in the estimates of the various committees. The members were not successful in cutting down any of the items; but, on the other hand, a proposal to add £700 to the street lighting estimate, in order to provide for an advance of 2d. per 1000 cubic feet in the price of gas, was adopted by a large majority.

Blackburn Gas-Works Fire.—Last Tuesday, a fire broke out in the purifying-house of the Greenbank Gas-Works of the Blackburn Corporation. It was stated that, owing to spontaneous combustion, the contents of four carbon dioxide boxes had burst into flames. On the arrival of the local Fire Brigade they devoted their attention to isolating the four boxes from the others, and so prevented damage to the building, which is not connected with other parts of the works. The flames rose to a considerable height, and one or two slight explosions caused alarm. After about three hours' energetic work the firemen left, having successfully prevented damage to the building.

Early Appreciation of the Benefit of Gas.—The number of the "Times" for Jan. 22, 1816, contained the following intimation: We are glad to be able to inform our readers, that the proprietors of the gas manufactory have made the greatest exertions to abate whatever was offensive to their neighbours. The stench is almost totally removed by a contrivance which conveys the fetid liquor at once into the stream of the Thames, even at low water; and the smoke, besides being in a great measure consumed by the intensity of fires kept up to an excessive heat for the purpose, is made to pass through a tube of so great a height that, in the average state of weather, it rises a considerable degree above all the neighbouring houses, and even on the most unfavourable days is, from its rarity, too light to sink in atmospheric air. The inconvenience to the senses which still exists is so trifling that we hope that no person will put it in competition with what must universally be considered a public benefit.

Gas Affairs at Heywood.—At the last meeting of the Heywood Town Council the minutes of the Gas Committee were approved. These included the appointment of a Committee to report concerning alterations to the sulphate of ammonia plant as recommended by the Gas Engineer (Mr. W. Whatmough); an application by stokers for holidays with pay; and the adoption of a recommendation from the Master of the Mint urging the clearance of prepayment meters at more frequent intervals. At a special meeting of the Gas Committee a fortnight ago, it was resolved that four days' holiday with pay be granted for 1916 only, to stokers who may have been employed for not less than six months during the year ending May 31 next. The Chairman of the Gas Committee (Mr. David Healey) said the Committee had decided to clear the prepayment meters a little more often, and so give what assistance they could to the request of the Mint authorities. With regard to the holiday question, the men affected had not been working a full year, and they could only grant them four days' holiday instead of eight days.

Northallerton Water Loans.—Mr. R. Jameson informed members at the last meeting of the Northallerton Urban Council that the Local Government Board had intimated, in reply to the Council's application for an extension of the period for which the water loan had been made from 30 to 45 years, that they could not go beyond 30 years. However, Mr. Sandiman (the Chief Inspector of the Local Government Board) intended to use his influence towards obtaining the extension. The bankers had agreed to accept 4½ per cent., instead of the 5 per cent. they asked for; and this would mean a considerable saving.

"Pampered" Electricity at Dewsbury.—At the last meeting of the Dewsbury Town Council, Alderman J. M'Cann (the Chairman of the Gas Committee) moved an amendment to a recommendation for the purchase of a second-hand generating plant for an extension of the electricity undertaking, at a cost of £2925 for engine and housing. He said he was sorry to differ from the Electricity Committee, in whose doings he had taken a deep interest for 25 years; but the Government had definitely stated that expenditure of this description was not to be incurred. The Electricity Department had been pampered and given every encouragement, with results which were not satisfactory. While the capital outlay of over £69,000 had yielded only profits to the relief of rates of £4250 in the last ten years, the Gas Department, with a capital cost of £232,800, had provided over £69,000 for the rates in the same period. It was no use developing an undertaking which would be absolutely "flattened" if put into competition with the Yorkshire Electric Power Company, with whom arrangements could be made for any additional supply required by the department's consumers. The amendment was defeated, and the recommendation adopted.

Manchester Coroner's Jury and Naked Gas-Jets.—A Manchester Coroner's Jury recently investigated the cause of an explosion which took place at a rubber proofing works in the city, by which a workman lost his life and another received severe injuries. The explosion occurred in the room in which there were two machines for mixing rubber and naphtha. There were also a couple of tins in the room which contained about ten gallons of naphtha. Certain fumes arose from the rubber while undergoing treatment. A gas-engine was fixed in the room, which was illuminated by six gas-jets fitted with incandescent mantles, but no globes. A gas-jet was fixed just over one of the tins of naphtha, about a yard away. The Acting Coroner (Mr. C. W. W. Surridge), in his summing-up, said the probability was that the explosion was caused by the contact of the fumes and the gas. It seemed to him this was a case where the Jury might desire to recommend that electric lighting should be installed. A juryman, however, pointed out that, as this was the first mishap the firm had ever had, it was unfair to condemn incandescent gas lighting. The firm might, however, as an additional safeguard, have the lights enclosed in some way or other, to prevent anything falling into inflammable matter and causing an explosion. The Coroner said this would meet the case. The Jury returned a verdict of "accidental death," and recommended that naked lights should not be used in future—gas or electric.

Write for Particulars and Samples

THE WELSBACH LIGHT COMPANY, LTD.,
WELSBACH HOUSE, KING'S CROSS, LONDON, W.C.
AND AT BIRMINGHAM, MANCHESTER, LEEDS, STOKE-ON-TRENT, HULL, BRISTOL, AND DUBLIN.

Welsbach Mantles are Upright (C, CX, and Plaissetty) and Inverted.

Proposed Gas-Works Improvements at Ripon.—A decision has been come to by the Ripon City Council to apply to the Local Government Board for sanction to borrow £9000 for the improvement of the gas-works; and they appointed as Consulting Engineer Mr. J. Wilfrid Dunn, of Stockton-on-Tees. At the next meeting, Mr. Spence is to move—"That a small Committee be appointed to inquire into the terms and conditions under which a supply of electric light may be provided for the city by delegation of the Corporation's electric lighting powers to a suitable public company, and, after investigation, to report."

Colchester Gas Bill.—The Lexden and Winstree Guardians have adopted a report by a Special Committee recommending that they be authorized to negotiate for the insertion of clauses in the Bill of the Colchester Gas Company for the protection of the parishes affected, and, if needful, to instruct the Clerk to lodge a petition against the Bill. The Chairman (Mr. W. Deason) remarked that, so far as they were concerned, the principal point about the Bill was that the Company proposed to charge 9d. per 1000 cubic feet more than in the borough of Colchester. He thought it was not right that they should have a monopoly of this sort without a time-limit. Among other things, the Committee felt they must have some protection in regard to the breaking-up of roads.

The East and West Ardsley Urban Council have been informed by the Morley Corporation that, in view of the increased cost of coal and labour, the price of gas supplied to Ardsley is to be increased from 2s. 9d. to 3s. 3d. per 1000 cubic feet.

Mr. Harry Mitchell, of Leighton Road, Kentish Town, turning his attention for a brief space from patent lock manufacture, has designed a "Safety" Treasury Note wallet. A trial of one he has forwarded, proves his contention that the notes cannot work loose and fall out.

The West Riding County Council have decided that, unless clauses or amendments in protection of the interests of the County Council and the inhabitants of the Riding, to the satisfaction of the West Riding Law and Parliamentary Committee, be inserted, the Council will oppose the Beighton and District Gas Bill, the Wakefield Corporation Water Bill, and the Yeadon Water Company's Bill.

The Brighouse Corporation Gas Committee have been asked by the local branch of the Gas Workers' Union (whose Secretary is Alderman R. Morley) for an advance in wages of gas stokers to 6s. per shift; that they should receive a full week's holiday in summer with pay, and have double pay on Good Friday; and that the yard men and all others be paid the standard rate of 7d. per hour.

STOCK MARKET REPORT.

THE week just concluded on the Stock Exchange has been a good average one as times go nowadays, and business, though starting and closing quiet, quickened up to a considerable extent in between. Some markets, too, were conspicuously firm. Government issues were well supported. In mid-week the War Loan was a little prejudiced by a rumour of an approaching new loan; but this *canard* was promptly strangled, and the position was restored. Home Rails, which had been in great demand, reacted. In the Foreign Market, the French loan maintained its advance almost day by day, and now commands a nice premium. Japanese was a good second in the race; and Chinese also attracted some attention. Troubles still beset the American Market, and it had a very dull week. Encouraged by good harvest prospects, Argentines continued to rise; but the pressure was overdone, and a sharp reaction set in. In the Miscellaneous Market there were several strong corners. Rubber was, of course, by far the most conspicuous; the steady advance in the price of the material producing a big demand for shares. Oils, textiles, and various armaments also had a good time in varying degrees. So, taken all round, the general tendency was favourable—a contributing influence thereto being found in the successes of the Russian armies during the week. Among topics of interest, the dollar securities' mobilization is going on so well that the Treasury have extended their list of purchasable issues. But the House is rather sore at having, as they think, the wind taken out of their sails by the Government. The popularization of Exchequer Bonds by the issue of small denomination bonds is growing. The question of promoting this by a preferential lightening of the income-tax on bonds is being mooted. But the inculcation of thrift upon the people is being heavily handicapped by the amazing revelations of waste in Government departments, some of which appear, to be irrefutable. Unrest at the inequitable working of the minimum prices is again manifesting itself on the Stock Exchange. In the Gas Market, business was more active, and the tone was stronger. The announcement that the Gas Light and Coke Company will maintain their statutory dividend and will carry forward an increased balance was well received; and the ordinary stock rose 2¼ upon its opening price. Some other issues were strong. In the Money Market rates were materially harder.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 72½, 72⅞, 73, 73¼, ditto preference 76⅜, Oriental 99, 99½. On Tuesday, British debenture 52½, Gas Light ordinary 72⅝, 73, 73¼, 72⅜, 72½, ditto preference 76, Oriental 99, 99½, South Metropolitan 77, 78¼, ditto debenture 60¾. On Wednesday, Bombay 4⅞, Commercial 4 per cent. 76½, Gas Light ordinary 72⅜, 73⅜, Oriental 99⅛, 99½, San Paulo preference 8¼, South Metropolitan 77. On Thursday, Commercial 4 per cent. 75, Gas Light ordinary 73¼, 73⅜, ditto maximum 60, 60½, ditto preference 75½, Newcastle 81, Primitiva 2¼, South Metropolitan 77⅝. On Friday, Bombay 4⅞, Bournemouth 25⅜, 25⅞, Commercial 4 per cent. 75, Gas Light ordinary 73⅜, 73⅝, 74, 74⅛, 74¼, Imperial Continental 70½, South Metropolitan 77, 77⅞. On Saturday, Commercial debenture 54, Gas Light ordinary 74¾, ditto preference 76⅜, Imperial Continental 70, 70¼, Primitiva preference 70s., 72s., South Metropolitan debenture 61¼.

The Bank rate is 5 per cent.—as fixed on Aug. 8, 1914.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div or Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.				£ s. d.	
1,551,868	Stk.	April 8	2½	5⅕	Alliance & Dublin Ord.	59—64	8 18 2	..
374,000	,,	July 10	4	4	Do. 4 p.c. Deb.	76—79	5 1 3	..
380,000	5	April 29	7½	3/-	Bombay, Ltd. . . .	5⅞—6⅜	5 17 8	4⅜
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water { 10 p.c. . .	29—30	5 6 8	25⅜—25⅞
878,480	10	,,	7	7/-	{ B 7 p.c. .	15—15½	4 10 4	..
95,000	10	,,	6	6/-	{ Pref. 6 p.c.	13½—14	4 5 9	..
147,210	—	—	—	4	{ Deb. . .	..	—	..
880,000	Stk.	Feb. 26	†14	†6/-	Brentford Consolidated	261—266	5 5 3	..
880,000	,,	,,	†11	55/-	Do. New . .	204—209	5 5 8	..
50,000	,,	,,	5	5	Do. 5 p.c. Pref. .	109—111	4 10 1	..
206,250	,,	June 11	4	4	Do. 4 p.c. Deb. .	91—98	4 6 0	..
217,380	Stk.	Feb. 26	£1	10⅜	Brighton & Hove Orig.	208—213	5 8 4	..
244,200	,,	,,	8	7⅜	Do. A Ord. Stk. .	154—159	5 0 8	..
580,000	20	Mar. 26	12½	22/6	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	52½
245,771	Stk.	June 26	4	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	4/6	Do. 4½ p.c. Pref. .	4—6	—	..
100,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	5	Chester 5 p.c. Ord. . .	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	5 1 2	75—76½
560,000	,,	,,	5½	46/8	Do. 3½ p.c. do. .	103—105	5 1 6	..
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 8 11	54
800 000	Stk.	,,	4	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
278,420	,,	,,	—	11½	Croydon B and C 7 p.c.	..	—	..
4 2,270	Stk.	—	6	6	Derby Con. Stk. . .	123—125	4 16 0	..
55,000	,,	—	4	4	Do. Deb. Stk. .	102—104	3 16 11	..
1,002,180	10	July 29	10	10/-	European, Ltd. . . .	17½—18	5 11 1	..
16,362,910	Stk.	Feb. 12	1/17/4	42/-	Gas Light and Coke { 4 p.c. Ord. . .	98—102	4 15 6	72½—74½
2,600,000	,,	,,	3½	3½	{ 3½ p.c. max.	76—79	4 8 7	60—60½
4,062,235	,,	,,	4	4	{ 4 p.c. Con. Pref.	96—99	4 0 10	75½—76⅜
4,674,850	,,	June 11	3	3	{ 3 p.c. Con. Deb.	72½—74½	4 0 6	..
130,000	,,	,,	10	10	{ 10 p.c. Bonds .	..	—	..
258,740	Stk.	Mar. 12	5	4½	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	6	Hongkong & China, Ltd.	16½—16¾	6 11 4	..
86,603	—	—	—	9½	Hornsey 7 p.c. . . .	..	—	..
131,000	Stk.	Mar. 12	7½	7⅜	Ilford A and C . . .	151—154	5 2 4	..
65,780	,,	,,	6⅜	6¼	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	4	Do. 4 p.c. Deb. .	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	4½	Imperial Continental .	150—160	5 12 6	70—70½
1,235,000	Stk.	Feb. 12	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
200,242	Stk.	Mar. 12	6½	6½	Lea Bridge Ord. 5 p.c. .	119—121	5 7 5	..
561,000	Stk.	Feb. 26	10	10	Liverpool 5 p.c. Ord. { A	211—213	4 13 11	..
718,100	,,	,,	7		{ B	146—148	4 14 7	..
306,083	,,	June 26	4	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅜	6 9 9	..
250,000	100	April 1	4½	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	6/-	Monte Video, Ltd. . .	11½—12	6 13 4	..
1,775,892	Stk.	July 29	4½	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	81
529,705	Stk.	June 26	3½	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	7/8/8	North Middlesex 7 p.c.	14—15	5 2 8	..
800,000	Stk.	May 14	8	8	Oriental, Ltd. . . .	117—122	6 11 2	99—99½
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd. . . .	7½—7⅞	6 9 0	..
60,000	50	Feb. 26	12	65/-	Portsea, Island B . .	128—131	4 19 8	..
100,000	50	,,	12	60/-	Do. C . . .	118—121	4 19 2	..
52,000	50	,,	10	—	Do. D . . .	..	—	..
249,980	5	April 29	8	—	Primitiva Ord. . . .	5½—6	6 18 4	2¼
499,960	5	June 26	5	2/6	,, 5 p.c. Pref. .	4½—5	5 0 0	70/—72/-
521,600	100	June 2	4	4	,, 4 p.c. Deb. .	91—93	4 6 0	..
—	—	—	—	4	,, ,, 1911	..	—	..
846,198	Stk.	June 26	4	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	5 9 1	8⅛
125,000	50	July 1	5	5	{ 5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	10	Sheffield A	223—224	4 9 8	..
209,984	,,	,,	10	10	Do. B	222—224	4 9 8	..
523,500	,,	,,	10	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	6/-	South African . . .	10½—11½	7 16 6	..
6,429,895	Stk.	Feb. 12	5/4/0	44/-	South Met., 4 p.c. Ord.	111—113	4 16 8	77—78½
1,895,445	,,	July 10	3	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	60½—61¼
209,820	Stk.	Feb. 26	8½	8½	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	,,	,,	5	5	Do. 5 p.c. Pref. .	110—112	4 9 3	..
135,000	—	—	—	48/4	Do. West Kent. .	..	—	..
137,058	,,	June 26	5	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
629,740	Stk.	May 14	5	5	Southampton Ord. . .	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½	7½	Tottenham District { A 5 p.c. .	135—138	5 8 8	..
742,275	,,	,,	6	6	{ B 3½ p.c. .	115—117	5 2 7	..
181,255	,,	June 26	4	4	{ 4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	5	Do. 5 p.c. Deb. Red.	93—95	5 5 3	..
236,476	Stk.	Mar. 12	5	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅝	78/9	Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅞	63/9	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/8	55/1½	,, C 3½ p.c.	110—115	5 2 0	..
852,000	,,	,,	6½	57/6	Wimbledon 5 p.c. .	117—122	5 0 5	..
98,000	,,	,,	6⅝	63/9	Epsom 5 p.c. . . .	121—126	5 5 2	..
88,416	,,	June 26	3	3	3 p.c. Deb. Stk. . .	66—69	4 6 11	..

† Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

SOLE MAKERS OF THE CONTINENTAL & COAL WASHER. T. R. & J. DEMPSTER, LTD. 54 & 2286 Manchester.